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CHICAGO, MAY, 1914.

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DRAWING A CONTRACT.

WHEN we pointed out, last month, the many objections to the proposed form of Bell connection contract, the directors of the Independent Telephone Association of America had not yet taken action upon it. As we predicted, however, the meeting of April 11 disclosed a strong feeling against the contract, not only among the directors, but as evidenced by some two hundred letters received by the secretary from member companies.

That contract, as we said thirty days ago, was merely a first draft—suitable only as a nucleus on which to build an equitable agreement. The Independent Telephone Association of America has taken that view of it. At the April meeting a committee consisting of Messrs. Randall, Hubbell, Wright, Uhl and Reber was appointed to make a draft of a modified form of contract which will be submitted back to the A. T. & T. Company. Even if the form it proposes should be as one-sided for the independents as the first draft was for the Bell, it will still represent good business practice. There is plenty of opportunity and plenty of time for a definite and satisfactory settlement of the problem if a dozen drafts are discarded before the right one is drawn.

The committee has not yet reported. We trust it will not report until it has covered every point of value to the independents, so that no dissatisfaction may arise later. There is no hurry; let the committee take time to get the opinion of every member of the association, and even, if may be, the opinions of non-members. The Bell Company has committed itself to the acceptance of some kind of a contract, and it is up to the independents to see that the one finally agreed upon is favorable to them.

The United States Department of Justice has told the association: "Only in the event that the proposed contract appeared not to carry out the undertaking of the Bell companies as expressed in their letter of December 19 last, would this department be called upon to take any action in respect of it." That is virtually an admission that the department has approved the original offer, and that whatever contract is finally accepted will have to be based upon the letter of Mr. Kingsbury. Take another look at that letter—it was reproduced on page 2 of our January issue. It will be observed that practically every objectionable feature of the contract had its herald in the letter. The Department of Justice has not approved or disapproved the draft contract; but it has approved the letter.

It is the intention of the association committee to consult with the Department of Justice before committing itself to any contract. This is good policy, for it may be necessary to convince the department that no

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ED J. MOCK, *Business Manager.*

Sworn to and subscribed before me this twenty-first day of March, 1914.

(Seal) Leona J. Ekstrom.

My commission expires Aug. 17, 1914.

contract based on the already approved letter can possibly prove equitable. It is reasonable to assume that the government's legal lights will not be unfriendly in the matter, for we take it that their endorsement of the Kingsbury letter signified merely approval of its principle and spirit, and did not commit them to support any of its technical details. This is a question which should be definitely decided before final ratification of any contract.

BRITISH GOVERNMENT TELEPHONES.

WHILE the whole country is agog, more or less, over the little understood question of government ownership of telephones, Will Payne has been doing some actual telephoning over government switchboards in England and writing what he thought about it to the editor of the *Saturday Evening Post*.

Now there is very little to gain by reprinting *Saturday Evening Post* stuff. Everybody has read it before you get to it. But just for argument, and because the editor of the *Post* has said we could, we are going to select a few paragraphs of Will Payne's, here and there, and put them on record as telephone history. For instance:

When an American would telephone as a matter of course, an Englishman is quite apt to push a button, send a telegram, write a letter or dispatch a messenger. The greatest business institution in the British Isles is, of course, the Bank of England; and the only reference to this institution in the London telephone directory is as follows:

"Putney, 934. Bank of England Sports Club. Roehampton."

In lighter moments Englishmen may telephone; but when the sports are at work in Threadneedle Street they rely on more time-honored means of communication. To be sure the Bank of England is a peculiarly conservative establishment. Latterly no stranger may enter its doors except by bringing a satisfactory letter of introduction, and a rosy-cheeked giant in flaming gold-and-scarlet clothes stands at the portal to see that no unvouched-for stranger enters. However, the fact that the bank gets on very comfortably without a telephone shows the comparatively restricted use of the instrument in England.

* * *

In January last, after the post office had been operating the telephones for more than two years, the *Daily Mail* inquired editorially:

"Why is that government ownership management of telephones is practically always a failure? Why is it that for every thousand Europeans there is only one telephone, while for every thousand Americans there are fifteen? Why is it that not one of the many discoveries that have transformed the telephone industry in the last thirty years has emanated from a department of state? Why is it that throughout the length and breadth of Great Britain and the Continent hardly a single efficient long-distance service is to be found?" And so on to the extent of nearly a column.

True, the *Daily Mail* is an opposition paper and may be prejudiced; but very recently the *Evening News* has undertaken to tell the London public how to use a telephone. Its introductory announcement says:

"It was in January of last year that we first discussed the scheme with the authorities of the post office. The showers of criticism that have fallen since that time prove that the public have had very real grievances. On the other hand, the restrictions that are imposed on all government departments in the issue of statements to newspapers have prevented the telephone officials from replying or explaining.

"Now the *Evening News* has the distinction of being accepted as a medium between the post office and the great London public. . . . The scheme was postponed for a year at the request of the post office, whose hands were full as a result of taking over the National Telephone Company. . . . The post office will permit our special commissioners to have full access, with expert aid, to all mechanical plants, to see the workings of the exchanges, to inquire into matters that have led to complaints from subscribers. . . . Largely, we may say, the telephone problem is a new one in England. It has been neither studied nor used as it should have been, and as it is studied and used in America."

The *Evening News*, I may mention, claims to have three million readers and is an eight-page paper. At this writing it is giving up two full columns on the editorial page once a week to this new and important matter of instructing the public in the use of telephones, explaining how mistakes and delays arise, and so on. This strikes me as interesting evidence as to the state of telephone service in London.

No doubt every newspaper reader knows that the British government took over the privately owned telephone lines; and that fact is often cited as a precedent for the United States—as though for our government to take over the Bell system would be substantially what the British government did. However, except that each country has a government and a telephone system, there is hardly a point at which conditions in the two countries are comparable.

In the first place the British government had been in the telephone business for many years. Long before the purchase of the private wires its lines in London were in active competition with those of the National Telephone Company—the concern roughly corresponding to our American Telephone and Telegraph Company, or Bell system.

In 1901 the government made an agreement with the company which contemplated that it should take over the company's lines in London and amalgamate the two competing systems; in fact the year before the government did take over the privately owned lines the post office was operating nearly eighty thousand telephones in London, or over half as many as the National Telephone Company had in that city.

Moreover, a number of cities, such as Hull, Glasgow, Swansea, Brighton and Portsmouth, had municipally owned telephone systems; so years ago public ownership and operation of telephones was a well-established fact in England.

More important still, the National Telephone Company operated under a license from the British government. This license was granted in 1881, to run for thirty years; and it provided that at certain periods the government might buy the company's plant and take over its business.

Thus there was always a perfectly simple, definite method by which the government could take possession of the privately owned lines. There could be no denial of this right or any dispute about it, because it was stipulated in the license under which the company did business. And at the end of thirty years the government could put the company out of business by simply refusing to renew its license. In its relations to the government the company was in the position of a tenant with an expiring lease.

I need hardly point out how different the situation is in the United States. Our telephone company has no contract relations at all with the federal government. Its charters are derived from the several states. It is not dependent on Washington for any of its powers or privileges. In undertaking to buy it, therefore, our government would be in a position very different from that occupied by the British government when it undertook to buy the National Telephone Company.

In 1905, then, the British government was already in active competition with the National Telephone Company. There was nothing to prevent it from extending that competition indefinitely. The company's license had but six years more to run. At the end of that period it must go out of business unless the govern-

ment chose to renew the license, in which case the government could exact such terms as it saw fit.

* * *

As the two were unable to agree, the matter was left to arbitration, as provided for in the stipulations; and the arbitrator was the Railway and Canal Commission, which is another department of the government. This is very much as though our government and telephone company, being unable to agree on the value of the telephone plant, should leave it to the Interstate Commerce Commission. Only the telephone company would hardly do that.

The postmaster-general mentions in his annual report, as though it were a rather remarkable fact, that the arbitration proceedings before the Railway and Canal Commission occupied commented on the circumstances as though legal proceedings continuing for seventy-four days were something extraordinary. At the end of that period the commission gave a judgment seventy-four days; and I recall that some English newspapers awarding the company sixty-two million dollars, or less than two-thirds of its original claim; and that practically settled it.

* * *

Still more important is a comparison of what the British government took over. As I mentioned above, it already had about eighty thousand telephones in London, and in acquiring the National Company's system it got about a hundred forty thousand more. It also got about four hundred thousand telephones in England, Ireland, Scotland and Wales, outside of London. In short, measured by the number of telephones, the system the British government acquired was not a great deal larger than the combined systems of Chicago and Philadelphia. There are four million and a half subscribers to the Bell system in the United States; and the total number of telephones, I believe, is more than ten times the number taken over by the postmaster-general.

* * *

Quite as important as the financial problem is the further circumstance that the employees of the National Telephone Company at the time of its acquisition by the government numbered eighteen thousand, while the Bell system reports a hundred and thirty thousand employees.

* * *

The National Telephone Company's license required it to pay the government a yearly royalty amounting to ten per cent of its gross exchange receipts. In the last year of its existence it paid the government on that account one million seven hundred thousand dollars. As to the fiscal results of government operation, all I have is the brief statement in the postmaster-general's annual report, which shows a gross telephone revenue of a little over twenty-eight million dollars and a net revenue of a million nine hundred thousand dollars—or substantially what the National Company would have paid the government as a royalty if it were still operating the lines. The National Company, however, paid a six per cent dividend on its stock after paying its royalty to the government.

The same report says that service in London was improved during the year, "the number of completed calls being kept steadily between seventy and seventy-one per cent"; whereas in 1911 it was between sixty-five and sixty-seven per cent. I do not dispute the figures; but all the telephone users I talked with seemed unable to appreciate the distinction between getting their number seventy per cent of the time as against only sixty-five per cent. I think it a fair statement that the service, originally not good, has not improved under government ownership. Rates have not been reduced; and the meager information so far available indicates that the government has made less profit from the lines than the private owners did.

Telephoning is cheaper in England than in the United States. The charge for a business telephone in London, with unlimited service, is eighty-five dollars a year; or one can get a residence telephone by paying five dollars for the instrument and two pence—or four cents—a call. But these rates have no particular bearing on the question of government ownership, as they were the same when the lines were privately owned; and the rate signifies little, except when the quality of service is also taken into account. Cotton is cheaper than wool—but nobody wants a winter overcoat made of it. The only object of a telephone anyway is to save time and effort; therefore a cheap, slow service may be really dearer than a more costly and faster one.

* * *

There was always a reason why the British government should go into the telephone business. That reason is that, for more than forty years, it has had a monopoly of the telegraph business. It acquired the privately owned telegraph lines in 1870; and here again I may point out that the total investment was only forty million dollars, which, by the way, was substantially twice what it was estimated to be when the bill passed Parliament; but taking over a forty-million-dollar concern is rather different from taking over a several-hundred-million-dollar one.

* * *

In all branches the British post office employs two hundred and forty thousand persons—a fact which has considerable political significance. About a decade ago relations between the post office and its employees were decidedly strained, because the post office refused to recognize the labor unions to which some of its employees belonged—insisting on dealing with its men as individuals rather than through the representatives appointed by the unions.

* * *

The upshot of the contest was that the post office recognized the unions. Naturally this increased the membership and strength of the unions, and in late years labor questions have been settled by conferences between representatives of the post office and rpresentatives of the unions.

That the organized employees of the post office constitute a political factor that every political leader is bound to take into account cannot be disputed. The reader may regard that as a good thing or a bad thing, according to his taste and inclination; but it is a thing that must be taken into account in any consideration of government ownership in a democratic country.

In striking against a government the men usually have public opinion against them. In striking against a private employer public opinion is likely to be with them. And every experienced labor leader knows—though he may deny it on occasion—that public opinion is an important element in nearly every strike.

* * *

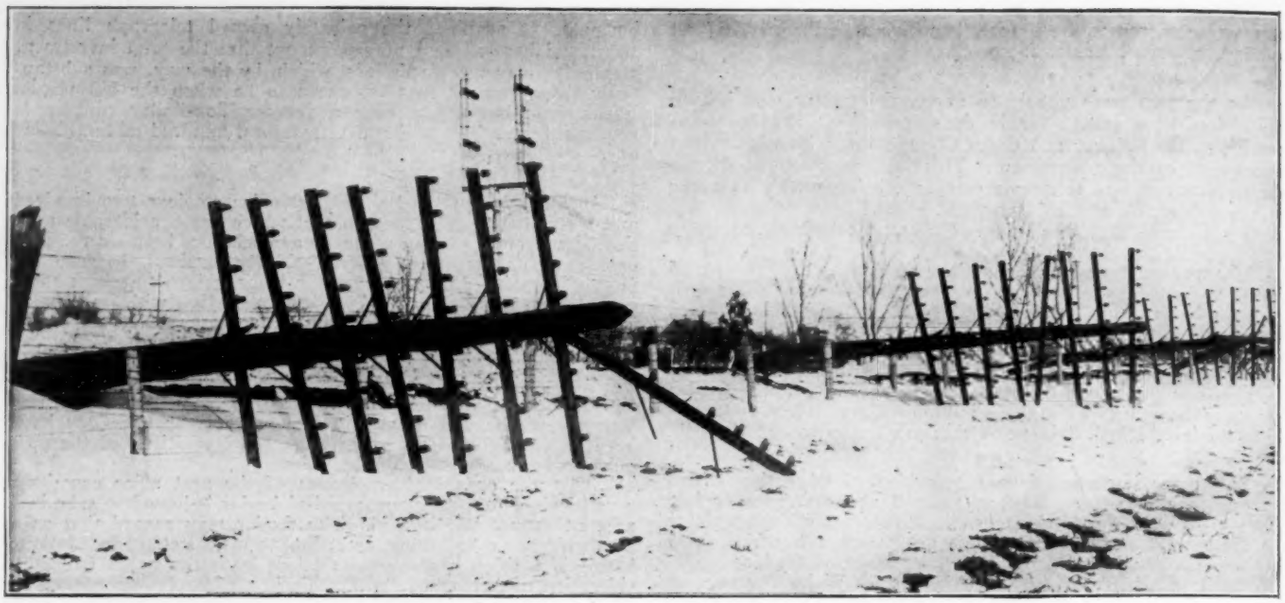
The British government has operated the telegraph for more than forty years—practically growing up with it, for the total number of telegrams handled in its first year was under ten millions, against over ninety millions now. Considering the deficit, it is doubtful whether it handles telegrams more cheaply than a private corporation would; but it is a fairly satisfactory established condition and it ought not to be radically changed except for some cogent reason. There ought to be a strong presumption that somebody would benefit by a change.

I believe the British mail service is better than ours, and if that assumption is correct a fair inference from it would be that our post-office department would handle telegrams and telephones less efficiently than the British post office does.

As for England's experience with publicly owned telephones, there is nothing in it from which a fair argument for public ownership of telephones in the United States can be deduced.

We have printed rather more than we intended of this, because it is so interesting that it is hard to excerpt it. Of course, there is nothing particularly new about it; we have said most of it ourselves at one time or another in a less interesting way. But then there is nothing new about the government telephone problem anyway. Everywhere but in this country it is the usual thing—and everywhere it is unsatisfactory, at least from our standpoint and standards.

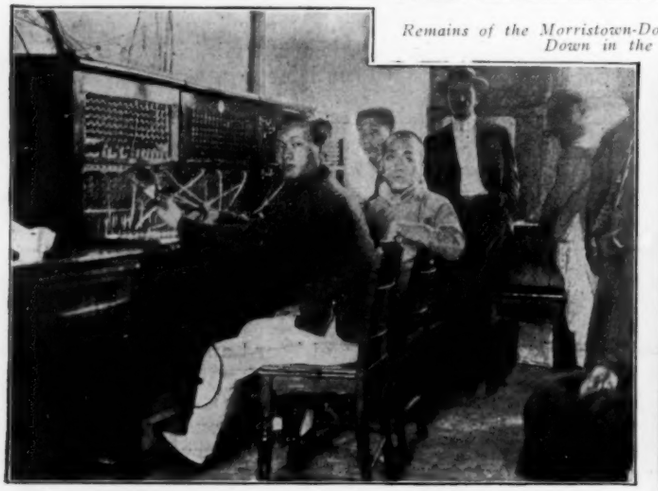
We have enough material in the office to fill an edition of TELEPHONE ENGINEER with perfectly good evidence against government telephones. We will continue to publish it in small doses for some time to come. But we prefer, when we can, to substitute other information for our own—especially information gathered by those who, like the *Saturday Evening Post*, have no axe to grind and cannot possibly be prejudiced one way or the other. For we are prejudiced—we admit it frankly. From what we have seen and heard and read, we do not believe this government, or any other government could operate a telephone system and satisfy the American people. And we know that operation and progress under private ownership are quite satisfactory. So our only apology for this comment is that the enormous circulation of the *Post* deprives the reprinted material of novelty; but it does not decrease its value as a document of telephone history.



Telephone Wires Down Along the Tracks of the C. R. R. of New Jersey in March.—Western Electric News.

Lighter Leaving Hastings, N. Y., with a Load of Wire for Storm Repairs.

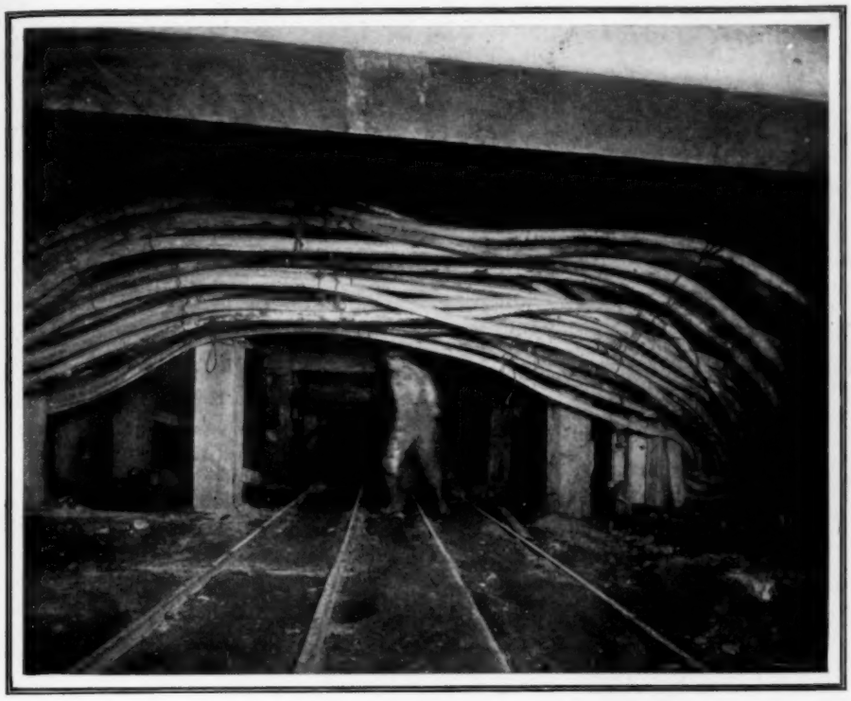
Remains of the Morristown-Dover Trunk Line After the March Storms. Over Six Thousand Poles Went Down in the New York-Philadelphia Territory.—Western Electric News.



The Old Magneto Switchboard at Changsha, China, Which Was Replaced by Modern Equipment.—Western Electric News.

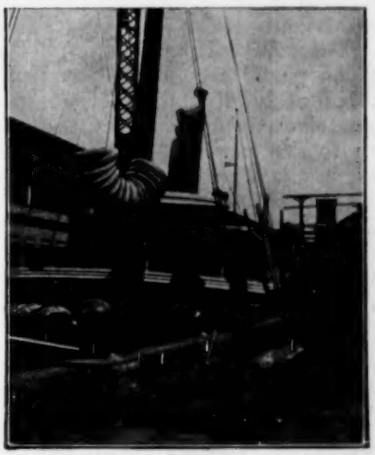
A Hint of the Rough Country Traversed by the Hawk's Nest-Hinton Line Just Completed in West Virginia. Photo by The Transmitter.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.



Telephone Cables Tied Up with Ropes to Clear the Way for Rapid Transit Construction in the Subway at the Corner of Cortlandt and Church Streets, New York City. These Cables Were Previously in Tile Duct Conduit, Which Was Entirely Demolished. They Will Have to Be Maintained in Temporary Condition for About Three Years While the Work on This Part of the Big Subway is Being Completed.—Photo by Courtesy of The Telephone Review.

A Giant Rainier Fir—Cross Arm Material.



Hastily Unloading Coils of Wire by Derrick—Storm Repairs in the East.

Underground Cable on Poles Along South Chicago Avenue, Chicago. Three Heavy 200-Pair Underground Cables Were Suspended on Stub Poles for Six Months While Railroad Elevation Work Was Being Done. Service Was Not Interrupted When the Conduit Was Broken Away and the Cables Lifted to the Poles. The Underground Cables Stood the Unusual Conditions Without Causing Any Trouble Whatever.

"Gracious! There's the Phone!"
Copyright, 1914, Life Publishing Company.

STORIES OF PICTURES OF TELEPHONE PRACTICE ANR PROGRESS IN ALL PARTS OF THE WORLD.

Operators' Wages in England

Exclusive of the staff transferred from the National Telephone Company, there are about 1,313 female telephone operators employed within the London postal area, says the *Electrician,* 89 at exchanges in the London telephone district but outside the London postal area, and 2,605 in the provinces. In London telephone operators are recruited by selection from applicants between the ages of sixteen to nineteen, and are kept in a class of learners for about eight weeks, and while in this class they are paid 7s a week. In the province telephone operators are similarly recruited, but are given no pay for one month during which they are being trained, and then 5s a week for the second month, and are appointed as unestablished telephone operators when a vacancy arises—a period in some cases elapsing after the second month during which no pay is given, or if some work is performed pay only at the rate of 2½d an hour or 10s a week. Telephone operators are unestablished for the first two years of their service after appointment, and during this time they receive for the first year 11s a week in London and 10s a week in the provinces, and for the second year 14s a week in London and 12s a week in the provinces. (One shilling or 1s=24½ cents.)

The scales of pay upon establishment are, within the London postal area, at 18 years of age, 16s a week, at 19, 18s, at 20, 19s 6d, at 21, 21s per week, and then by annual increments of 1s 6d to a maximum of 27s and then to 28s per week; and outside the London postal area, in Class I, offices in the provinces—at 18 years of age they receive 14s per week, at 19, 16s, at 20, 17s 6d, at 21, 19s, and then by annual increment of 1s 6d to 25s, and then to a maximum of 26s per week; at Class II and III offices they receive at 18, 14s per week, at 19, 16s, at 20, 17s 6d, at 21, 19s, then two annual increments of 1s 6d, and then by annual increments of 1s to a maximum of 24s a week; and at Class IV and V offices they receive at 18 years of age, 13s 6d per week, at 19, 15s, at 20, 16s 6d, at 21, 18s, and then by two annual increments of 1s 6d, and one increment of 1s to a maximum of 22s per week. The classification of offices outside the London postal area is based upon the classification for sorting clerks and telegraph operators. In the London telephone service there are 21 allowances of from 3s to 5s for supervision, and in the telephone service in the provinces 96 supervision allowances of from 3s to 5s. A few French-speaking operators employed in London enter at 14s, rising after one year to 16s, and on establishment if 18 years of age, to 18s, and receive one increment in advance of other operators, but rise to the same maximum. Call-wire operators entered the scale at wages fixed according to age, qualifications and experience. Call-wire operators were recruited from sub-office assistants and other persons with a knowledge of telegraphy.

The hours of work of telephone operators are 48 a week, a meal relief of half an hour or more being allowed out of the working hours in some instances, according to the regulations. Attendance between 8 p. m. and 6 a. m. counts as night duty, and seven hours night duty counts as eight hours day duty. Operators receive 12 working days' leave while unestablished, also sick leave, on the conditions applicable to all full-time female un-established officers. When established they receive 14 working days' leave during the first five years and 21 working days' leave after five years, established service. Medical attendance, sick leave, pensions, marriage gratuity, are granted on the same conditions as to other female established officers.

Inductive Effects from High-Tension Lines

High-tension power circuits paralleling long-distance telephone circuits produce in the latter disturbances that not only impair the service but sometimes threaten the existence of the telephone apparatus itself, says the *Electrical Record.* The problems arising from this source are almost as serious and quite as evasive as those due to lightning, and they are of the same general nature. These problems apply directly to long telephone circuits paralleling high-tension lines for any considerable distance, and especially in the case of telephone circuits used in electric railway train dispatching, or in close proximity to or occupying the same poles as the high-tension wires.

Induction is the peace disturber, and apparently appears on the slightest pretext. A wet limb of a tree swinging against the 50,000-volt line for an instant; a heavy and saturating fog; an insulator cracked and full of moisture; a heavy surge in the high-tension circuit; a slight ground on the high tension—in fact, anything tending to unbalance the high-tension circuit for the briefest part of a second—and the ordinary telephone lightning arresters are grounded from one end of the line to the other, or worse, a serious burnout occurs. In either event, the line is put out of service at the very moment when it is most needed.

Extensive researches have been made by many electrical engineers to develop a lightning arrester to combat this class of trouble. The requirements of the situation demand that an arrester for this purpose shall, first, in no way interfere with the service currents. Second, its resistance must drop instantly to a very low point when the induction, cross or lightning is on the lines. Third, its resistance and insulation must automatically and instantly increase to a high point when the disturbance, due to the foreign current, ceases, with the added safeguard to service that no ground is left on the line after such disturbance.

Bacteria in Transmitters a Fallacy

Not more than sixty-seven bacteria can be deposited in the transmitter of a telephone in a two-minute conversation punctuated at intervals with violent coughing, according to a special report on the possibility of the transmission of diseases by the public telephone mouthpiece made to the California state board of health by Esther M. Skolfield, assistant bacteriologist of the state hygienic laboratory.

This number of bacteria, the report indicates, is not sufficient to endanger health. In an ordinary conversation of from one to two minutes the number of bacteria found after a forty-eight-hour incubation period never totaled sixty-seven, the investigation disclosed. Dirty, wet mouthpieces taken indiscriminately from public telephones in most instances disclosed but few bacteria.

A summary of the important conclusions reached as a result of the investigation is that the only possibility of disease tranmission from telephone mouthpiece is by direct contact; that when the mouthpiece is dry the infectious dirt does not appear to become free dust; that the contraction of diphtheria and tuberculosis from public telephone mouthpieces is practically impossible; that the danger of infection from such a source probably is over-estimated and that sanitary devices and attachments are generally without value.

Tests of Rocky Mountain Woods for Poles

Bulletin of the United States Department of Agriculture

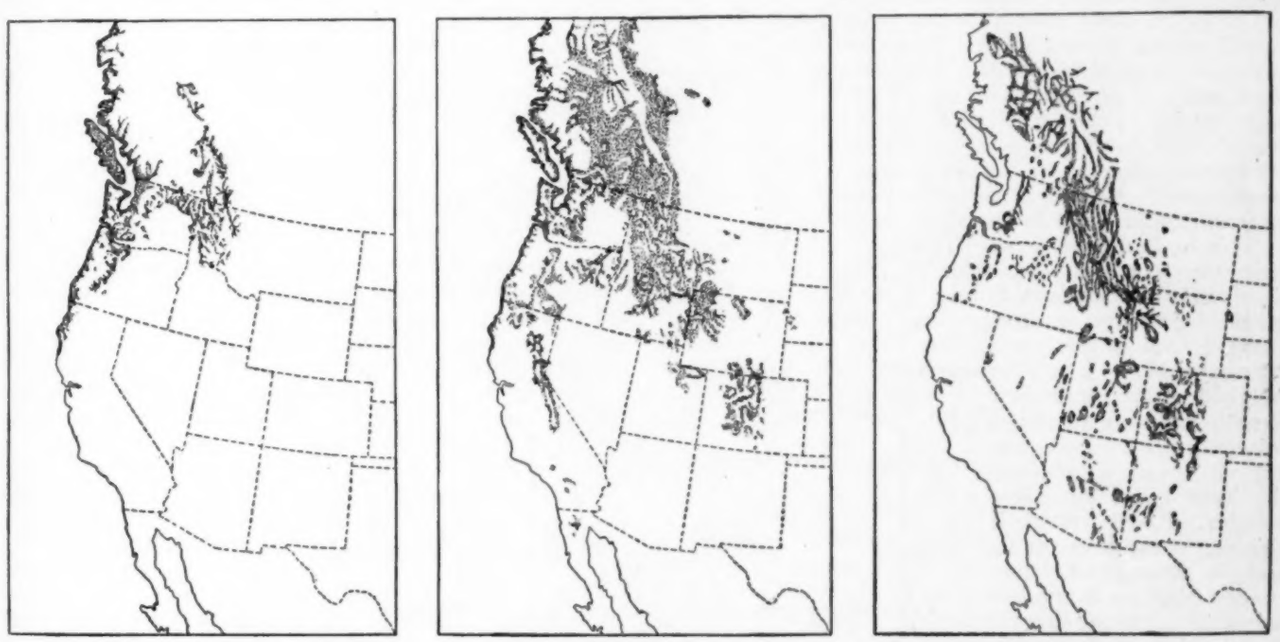
BY NORMAN DE W. BETTS AND A. L. HEIM

THE rapid extension of telephone and power lines in the West makes the question of pole supply one of increasing importance. Tests described in this bulletin show that both green and fire-killed lodge-pole pine and fire-killed Engelmann spruce will, under certain conditions, make suitable pole timbers. Western red cedar has long been the standard pole timber in the Western states. It has held its place mainly on account of its durability in contact with the soil, though its light weight has also been a very desirable feature. The tree (*Thuja plicata*) grows principally in Washington, Oregon, and northern Idaho. In addition to its wide use for poles, it is extensively cut for lumber, and especially for shingles. In the states south of its region of growth the cost of cedar is high, owing to the great distances over which it must be transported. Moreover, the heavy drain on the available supply must soon result in higher stumpage prices. There are at present in both the Rocky Mountain and Coast Ranges abundant stands of lodgepole pine (*Pinus contorta*), often called by local lumbermen "white pine," of little value for lumber, but well adapted for poles. Lodgepole pine is not naturally durable in contact with the ground, and for that reason has not been able to enter the field as a competitor of western red cedar. The general adoption of preservative treatment by railroad and telephone companies, however, has changed the situation. At an additional cost for treatment that still leaves the pine pole the cheaper of the two in most of the markets outside the region where cedar grows, the pine may be made to last longer than untreated cedar. Lodgepole pine takes treatment readily. Cedar, on the other hand, allows but a very shallow penetration.

Another tree, Engelmann spruce (*Picea engelmanni*) also has a wide distribution throughout the Rocky Mountains, although it grows commercially only at the higher altitudes. It is thus not as available as the lodgepole pine, nor in shape or in its ability to take preservative treatment is it so well adapted for poles. It grows farther south, however, and in many districts is the only native timber available for pole use. Fig. 1 shows the botanical range of growth of the three species. The relatively restricted range of western red cedar indicates the importance to the more southern mountain states of determining the value of local timbers for telephone and power line poles.

Forest fires in the Rocky Mountains have killed many stands of spruce and pine, and the disposal of this material, which, through checking, is rendered practically useless for saw timber, has always been a troublesome problem. On many areas such material remains entirely sound for a number of years after the fire, and, besides, is thoroughly seasoned and thus ready for treatment as soon as cut. In some regions the mines use all the available dead timber, though elsewhere there is a great deal of prejudice against the use of "fire-killed" material, under the mistaken assumption that there is some inherent difference in wood that has been seasoned on the stump and wood that has been cut when green.

The purpose of the tests described in this bulletin was: (1) To compare the strength of poles of western red cedar, the present standard, and of lodgepole pine and Engelmann spruce, and (2) to determine the value for pole timber of fire-killed pine and spruce in the central Rocky Mountain region.



Western Red Cedar. *Lodgepole Pine.* *Englemann Spruce.*

Fig. 1—Botanical Range of Western Red Cedar, Lodgepole Pine and Englemann Spruce.

The fire-killed material was donated by the Colorado Telephone Company and the Central Colorado Power Company. The remainder of the material tested was secured by the Forest Service, either by purchase or from the National Forests. The tests were made at the Forest Service timber-testing laboratory and were conducted in co-operation with the University of Colorado, Boulder, Colo.

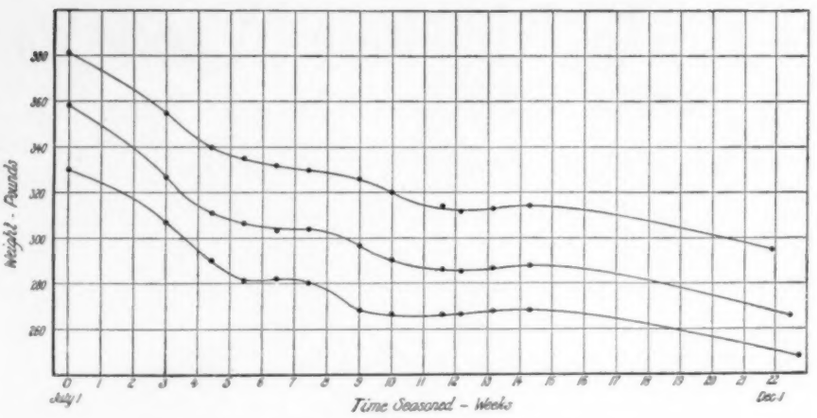


Fig. 2—Rate of Seasoning for Three Lodgepole Pine Poles.

MATERIAL TESTED.

The material for the tests consisted of poles nominally 25 feet long and of 7 inches top diameter. Average material was specified in each case.

Western Red Cedar.—Twenty cedar poles were purchased on the Denver market at a cost of $4 per pole. Information furnished by the seller showed the poles to have been cut during the winter of 1908-9, near Edgemere, Idaho. When received at the laboratory they appeared to be thoroughly seasoned, the bark probably having been removed at the time of cutting. All were nearly straight, and checked to the extent usual for seasoned material. A majority had straight grain.

Green Lodgepole Pine.—Twenty-two lodgepole pine poles were cut near Anaconda, Mont., in July, 1911, on the Deerlodge National Forest, in a dense stand on a gentle west slope at an elevation of about 6,500 feet. Upon arrival at the testing laboratory the poles were open-piled in two layers for seasoning. Three poles were weighed at approximately weekly intervals to determine the rate of drying. Fig. 2 shows graphically the rate based on these weights. Based on their shipping weight the poles had an average moisture content of 60 per cent when shipped. Assuming that the three poles represent the average of the shipment, the poles had dropped to 48 per cent moisture by the time they reached the laboratory. After 12 weeks' seasoning they had reached 30 per cent, and for 3 weeks thereafter their moisture content remained practically stationary, due probably to a period of damp weather. The weights taken at the time of test show that after seasoning for 22 weeks, practically from the 1st of July to the 1st of December, the poles contained about 22 per cent moisture. Fig. 3 shows the moisture distribution in four of the poles at the time of test. It indicates that the center of the poles was still at or above the fiber saturation point when tested. The poles checked considerably during the seasoning, but not to an unusual extent.

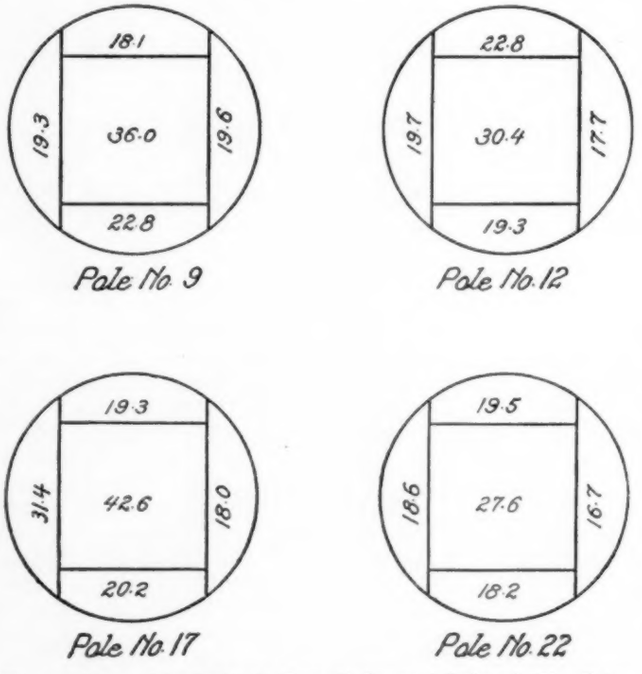


Fig. 3—Moisture Distribution in Four Air-Seasoned Lodgepole Pine Poles. Figures Indicate Percent Moisture Within Areas.

Fire-Killed Lodgepole Pine and Engelmann Spruce. — Twenty poles each of fire-killed lodgepole pine and Engelmann spruce were cut near Norrie, Colo., on a north slope at an elevation of about 10,000 feet. The area had been burned over by a light fire about 10 years previously. The poles were largely free of bark, though a majority had patches here and there, showing that no serious weathering of the surface had taken place.

Methods of Test.—Fig. 4 shows the method employed in testing. The poles were supported about 1 foot from each end in bearing blocks (*e, e*) resting on rocker supports (*f, d*) 23 feet apart. The load was applied by a universal testing machine through a bearing block (*t*) 5 feet from the butt end of the pole, or 4 feet from the center line of the butt support. The rocker support (*d*) rested on a pier (*c*) built on the floor. The rocker support (*f*) rested at the center of the auxiliary beam (*g*), one end of which was supported by a rail (*b*) and two piers (*a, a*). The other end of the auxiliary beam (*g*) rested on a roller (*k*) in the center of the weighing platform (*h*) of the machine. As the load was gradually applied at *t* the pole deflected, and the scale at n_2 at the center of the span, moved down with respect to a taut spring (*p*) stretched between pins driven into the pole on the neutral axis directly over the supports. The deflection of the pole at the load point was read on a scale (*m*), which gave the movement of the machine head (*t*) with reference to the platform (*h*).

Corresponding readings of the applied load, the deflection at the load point, and the deflection at the middle of the span were taken at convenient intervals, and plotted as shown in Fig. 5, until the pole was broken. The settling of the pole in the bearing blocks and deflection of the auxiliary beam (*g*) introduced slight errors in the determination of

the deflection. The total error was estimated as less than 3 per cent within the elastic limit, and the only calculated results affected by this (which was practically constant for all the poles) are the stiffness factor and elastic resilience, both of which are comparable only with results from tests of the same nature.

From each pole after test a 30-inch section of clear wood was taken and cut into 2 by 2-inch sticks. These were tested in bending, in compression paralled to the grain, compression perpendicular to the grain, and shearing. The method employed in making these minor tests is discussed fully in Forest Service Circular 38 (revised). The purpose of these tests was to determine the influence of defects on the strength of the poles.

To determine the moisture content, a 1-inch section was cut from each pole as near as possible to the point of failure, immediately weighed, and later dried to constant weight at the temperature of boiling water. The loss in weight divided by the dry weight is expressed in per cent of moisture.

The length, weight, and diameters of the poles were obtained just before testing. The age, rings per inch, per cent sap, and per cent summerwood were obtained after test from a section cut near the point of failure. The values for the amount of summerwood were obtained on a 2-inch length taken from an average portion of the section. Sketches were made of the manner of failure, principal defects, and any characteristics peculiar to the poles tested.

METHOD OF COMPUTING RESULTS.

The deflections and loads at elastic limit were taken from the load-deformation curves, a sample of which is shown in Fig. 5. To reduce the load recorded on the scale beam to the true load on the pole, all recorded values were multiplied by $\frac{23}{19} \times 2$. Stresses at elastic limit and maximum load were calculated for the outer fiber under the load point. The moment of three-fourths of the weight of the pole was added to the moment produced by the load. The comparative stiffness is expressed by the relation $\frac{P}{Id}$, when P is the load at elastic limit and I and d, respectively, the moment of inertia and the deflection at elastic limit measured at the load point.

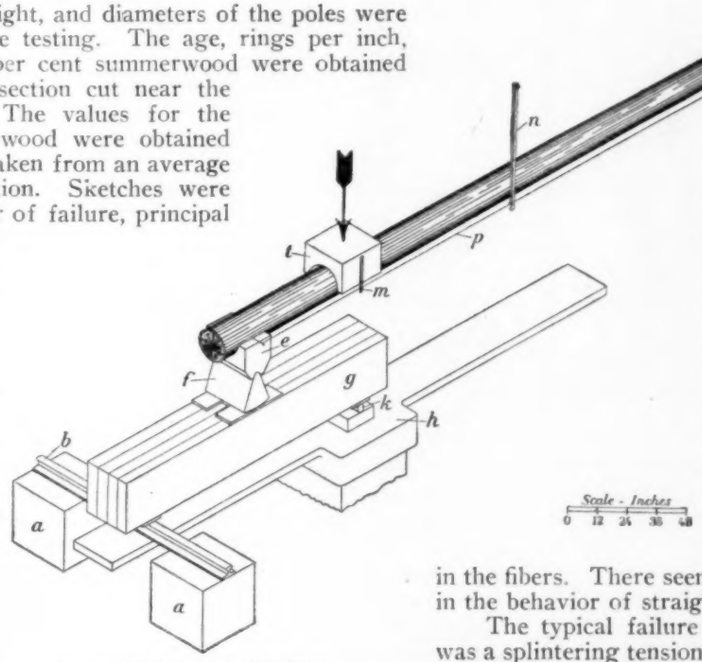


Fig. 4.—Method of Testing Poles.

The modulus of elastic resilience was obtained from the formula one-half $Pd \div$ volume. In obtaining the volumes there was found to be considerable difference in the shape of the poles. The spruce and pine were practically of even taper, and the volumes obtained by regarding the whole pole as one frustum of a cone (from top to butt diameter), or as two frustums (from top to center and center to butt), were practically the same. In the cedar, however, it was found necessary, on account of the flared butts, to use a three-frustum method (from top to center, from center to load point, and from load point to butt). There was about 10 per cent difference between results from the one and the three-frustum methods with this species. In calculating the dry weight per cubic foot, a total shrinkage of 12 per cent for the fire-killed pine and spruce was assumed, and 10 per cent for the cedar. The air-seasoned pine poles were considered as being one-third below the fiber saturation point (that is, a 4 per cent shrinkage in volume was assumed as having already occurred), and the others were assumed as being half-way between the dry and the fiber-saturated states.

RESULTS OF TESTS.

Character of Failures.—Fig. 6 shows the common types of failure occurring in the poles tested.

The bend of the pole while under load was at a maximum near the center of the span for the first part of the test and about 2 feet nearer the load point at maximum load. This shifting at the point of greatest deflection was most noticeable in the poles having a tendency toward longitudinal shear. The effect of knots was in evidence only as localizing the compression wrinkles and occasionally at the starting point of a tension crack. In the cedar poles many shallow ax cuts had been made when the bark was removed, and tension failures always took advantage of these breaks in the fibers. There seemed to be no consistent difference in the behavior of straight and spiral grain poles.

The typical failure of the western red cedar poles was a splintering tension about 2 feet from the load point. The wood separated easily along the annual rings, and the splinters were long and numerous. Probably due to this quality, as well as to the depth of checks, three poles failed in longitudinal shear, and in two others shear occurred after the maximum load had been passed.

In the air-seasoned lodgepole pine poles there were 18 tension failures and 4 failures from longitudinal shear. Of the 18 tension failures, 9 were of the splintering type characteristic of the cedar poles and 9 were simple tension failures; that is, without the exhibition of brittleness or unusual splintering.

The typical failure in fire-killed lodgepole pine was a simple tension close to the load point. The wood often had a rather brash appearance, and, except for two poles, did not splinter to any extent. One pole was brittle, failing near the center, and one failed by longitudinal shear after the maximum load had been passed.

In general the fire-killed Engelmann spruce poles failed in the same manner as the fire-killed lodgepole pine. Two poles had brittle tension failures, and there were no longitudinal shear failures.

The fact that 9 of the 42 air-seasoned and only 1 of

the 40 fire-killed poles failed by longitudinal shear might seem at first to indicate that the checking of the poles cut from green timber is deeper than that occurring in the more slowly drying fire-killed poles. The fact, however, that the average shearing stress of the cedar proved to be about 15 per cent lower than that of the other species, and further that the moduli of rupture in bending of both green-cut shipments were higher than those obtained in both fire-killed shipments, shows that there was a greater chance for shear failures in the air-seasoned material than in the fire-killed, aside from any difference in the manner of checking.

Compression of the upper fibers, as shown by wrinkles on the top of the pole, occurred some time before the maximum load was reached. There was usually a noticeable increase in the bend of the load-deflection curve after compression became visible.

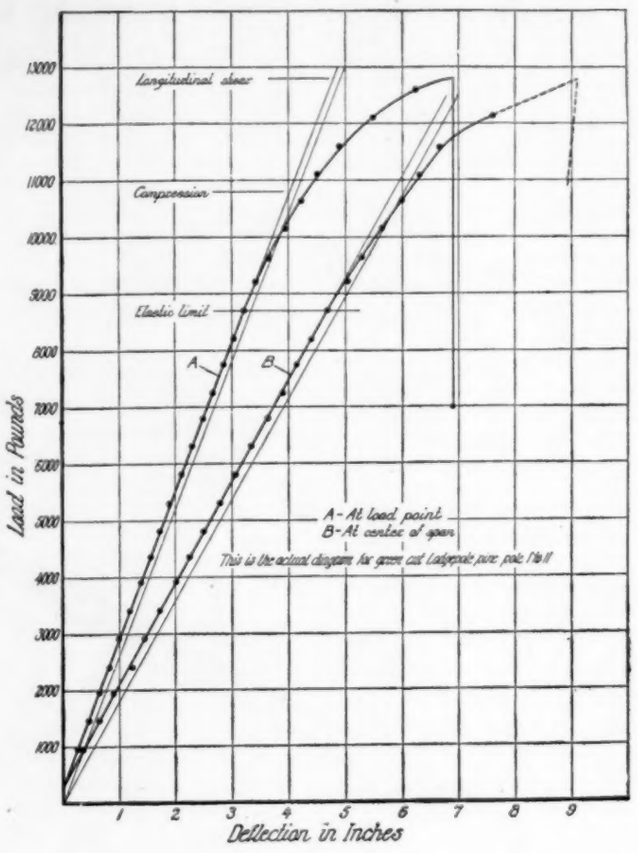


Fig. 5.—Typical Load-Deflection Diagram for Poles. (This is Actual Curve for Green Cut Lodgepole Pine Pole No. 11.)

Table 1 gives the maximum load of poles in terms of both the equivalent pull at the top and the actual load obtained in the testing machine at the ground line. This table is of value chiefly in comparing the results of these tests with those from other methods of applying the load, as all may be reduced to the reaction at the top support for poles of the same size.

Table 2 gives a summary and comparison of the average results obtained in the tests on the four classes of poles, based on the western red cedar as 100. On a basis of fiber stress developed it will be seen that—

1. Air-seasoned lodgepole pine is superior to western red cedar in all the mechanical properties determined.

2. Fire-killed lodgepole pine is only 80 per cent as strong as western red cedar at maximum load. In elastic values, however—that is, the fiber stress at elastic limit and the work absorbed up to this point—they are practically equal. In stiffness the fire-killed lodgepole pine is quite comparable to the cedar, although the latter proved to be a more flexible wood.

3. Fire-killed Engelmann spruce was inferior in all mechanical properties to the cedar and pine.

A comparison based on the fiber stress developed is equivalent to one based on uniform ground-line diameter. In practice, however, it is customary to specify top diameters. On a basis of measured tapers and the fiber stresses found by test, the loads may be calculated for all shipments, using a uniform top diameter of 7 inches. Table 3 gives the calculated loads for such a comparison. The tapers used in the calculations were, for western red cedar, 0.098 inch per foot length; for the air-seasoned lodgepole pine, 0.077; for fire-killed lodgepole pine, 0.096; and for fire-killed Engelmann spruce, 0.130. These tapers do not include the flare of the butt. The length from top to the load point was taken as 19.5 in all cases. Since the strength of a pole varies as the cube of its diameter, it is evident that differences in taper will materially affect the strength. On a basis of equal top diameters it will be seen from Table 4 that—

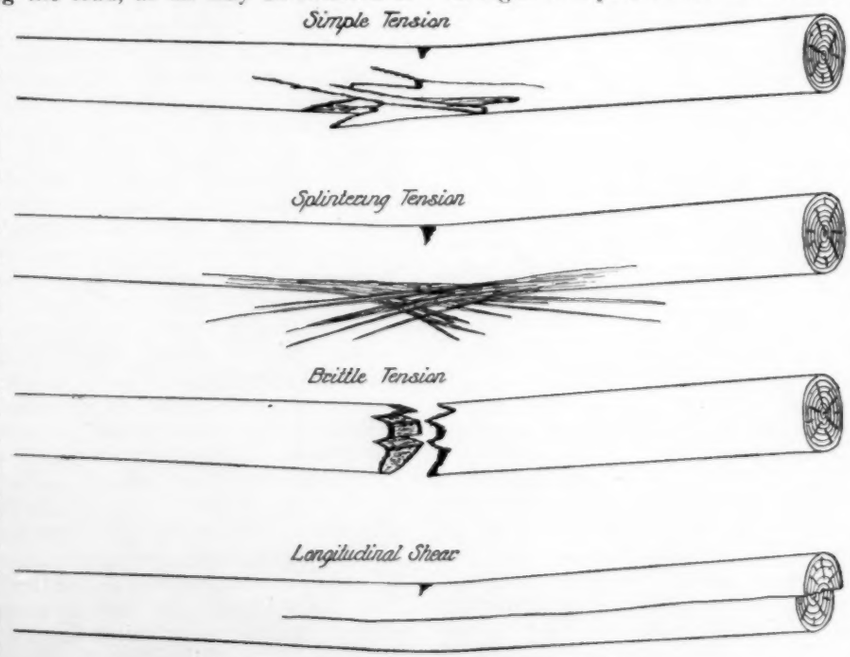


Fig. 6.—Types of Failures in Poles.

1. There is practically no difference in strength between air-seasoned lodgepole pine and western red cedar. In stiffness the lodgepole pine poles exceeded the cedar by about 25 per cent.

2. The fire-killed poles, both lodgepole pine and Engelmann spruce, were practically equal to the cedar in strength at elas-

tic limit and about 20 per cent below it at the maximum load.

Table 4 gives the average strength values of minor tests summarized by species and condition of seasoning. An examination of the average results shows in general very comparable values for the fire-killed pine and spruce and for the cedar. The cedar, however, falls about 16 per cent below the pine in shearing strength and the spruce about 12 per cent below it in crushing strength. The lodgepole pine from Montana showed a bending strength nearly 40 per cent greater and a crushing strength 18 per cent greater than the fire-killed lodgepole pine. It might seem at first sight that these differences were due to deterioration on the part of the fire-killed material, but an analysis of the values in regard to weight and a comparison with values obtained from other tests on lodgepole pine indicate that deterioration is not the probable cause of the difference. It has been proved conclusively that in any species the strength of the clear wood varies directly with its dry weight.

Table 1—Top and Ground-Line Loads Required to Break Poles.

	Western red cedar, cut green and air seasoned.		Lodgepole pine, cut green and air seasoned.	
	Top reaction at maximum load.	Maximum load at ground line.	Top reaction at maximum load.	Maximum load at ground line.
Average	2,050	11,785	2,250	12,930
Maximum	2,948	16,940	3,050	17,520
Minimum	1,473	8,470	1,770	10,190
	Lodgepole pine, fire killed 10 years.		Engelmann spruce, fire killed 10 years.	
	Top reaction at maximum load.	Maximum load at ground line.	Top reaction at maximum load.	Maximum load at ground line.
Average	1,830	10,510	1,775	10,210
Maximum	2,840	16,320	2,652	15,250
Minimum	714	4,110	731	4,210

In Fig. 7 the weight-strength relations are plotted for bending tests on small specimens cut from the tested lodgepole pine poles and for similar specimens taken from other material grown in Colorado and Wyoming, cut green and air seasoned. It will be seen that fire-killed lodgepole pine is equal in strength to the Colorado and Wyoming material cut green and air seasoned, and that the Montana material gave higher strength values because it was exceptionally heavy and much above the normal for Colorado-grown timber of which the fire-killed poles were representative. The soundness of the sticks cut from the fire-killed material also indicates that such timber has no inherent defect due to having been killed by fire. It seems more reasonable to regard it simply as seasoned wood, and to assume that deterioration due to age or exposure, if present, would be indicated by the same signs of decay that are apparent in any unsound material.

The relation between the stresses shown by the individual poles and those shown by the minor tests on the material cut from them is presented in Fig. 8. It should be remembered that the moisture content of the small specimens was only 8 per cent, as compared with an average of about 16 per cent for the poles. The green-cut lodgepole pine shipment averaged about 22 per cent moisture, though the outer shell of the poles was somewhat drier (see Fig. 3). This would tend to make the difference between the strength of the poles and the actual strength of the material in it much greater than was the case. For eastern spruce, strength in bending will be reduced by about 30 per cent when the moisture content is increased from 8 per cent to 16 per cent. Tests on lodgepole pine from Wyoming indicate a reduction, under similar circumstances, of about 25 per cent. The curves shown in Fig. 8 have, however, been plotted with the values as obtained from the tests.

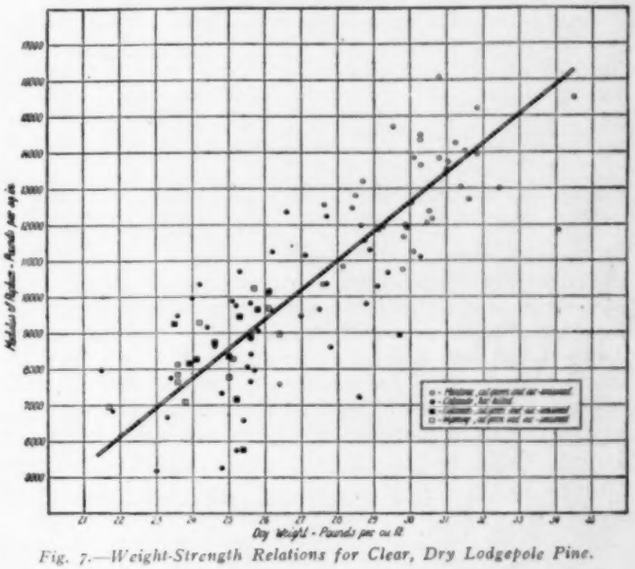


Fig. 7.—Weight-Strength Relations for Clear, Dry Lodgepole Pine.

Table 2.—Results of Tests on Poles, Summarized by Species and Condition of Seasoning.

Species.	No. of tests.	Top diameter.	Volume.	Weight per cu. ft. (oven dry).	Approximate age.	Rings per inch.	Per cent sap.	Per cent moisture.	Fiber stress at elastic limit.	Ratio to cedar.	Modulus of rupture.	Ratio to cedar.	Stiffness factor.	Ratio to cedar.	Modulus of elastic resilience.	Ratio to cedar.
		Inches.	Cu. ft.	Lbs.	Years.				Lbs. per sq. in.	Pct.	Lbs. per sq. in.	Pct.		Pct.	In. lbs. per cu. in.	Pct.
Western red cedar: Cut green and air seasoned—																
Average	20	6.98	9.5	21.4	84	18.4	32	15.1	4,430	100	6,885	100	6.75	100	0.94	100
Maximum	....	7.46	11.3	23.1	104	22.0	43	30.8	5,980	.....	9,360	.....	9.46	....	1.22	....
Minimum	....	6.15	7.5	19.3	55	13.0	21	12.0	2,900	.....	5,090	.....	4.43	....	.62	....
Lodgepole pine: Cut green and air seasoned—																
Average	22	7.36	9.9	27.6	162	34.0	48	21.9	5,280	119	7,680	112	8.62	127	1.00	106
Maximum	....	8.30	12.7	29.6	170	39.0	75	34.8	6,270	.....	9,500	.....	10.80	....	1.43	....
Minimum	....	6.70	8.1	25.5	144	29.0	34	18.5	3,830	.....	5,190	.....	6.35	....	.69	....
Fire Killed 10 years—																
Average	19	7.50	10.7	25.4	155	31.8	32	16.9	4,227	98	5,481	80	6.25	93	.97	103
Maximum	....	9.25	14.5	29.3	189	42.0	60	36.2	6,130	.....	7,480	.....	8.72	....	1.62	....
Minimum	....	6.75	8.9	21.6	97	17.0	19	11.2	2,230	.....	2,230	.....	4.42	....	.34	....
Engelmann spruce: Fire Killed 10 years—																
Average	20	7.23	11.2	22.3	164	34.3	....	16.3	3,489	79	4,378	64	4.97	74	.83	88
Maximum	....	8.00	13.7	26.3	210	46.0	....	32.8	5,210	.....	6,070	.....	6.97	....	1.25	....
Minimum	....	6.00	8.2	19.0	112	23.0	....	11.9	2,180	.....	2,180	.....	3.30	....	.44	....

The curves, arranged in order of the modulus of rupture of the poles from highest to lowest, show the relation between the modulus of rupture of the small, clear sticks and the fiber stress of the poles at the elastic limit and maximum load. The position and number of checks, knots, and other defects, rather than the quality of the clear wood, determines the grade of a pole. While the curve for the modulus of rupture of the small pieces is erratic, as would be expected from the rather small number of tests averaged for each pole, it shows a tendency to fall with a fall in strength of the poles, indicating the influence of the quality of the clear wood on the strength of the poles. The most important relation shown by the curves is that the ratios between pole and minor strengths are not the same for the different species, indicating that it is not safe to compare species for use as poles on the basis of the strength of their clear material. For example, western red cedar gave an average modulus of rupture for the small, clear beams of 9,305 pounds per square inch, and the lodgepole pine from Montana averaged 12,775. While the strength of the clear material of the pine is thus 37 per cent higher than that of the cedar, the average strength of the poles was a little less than 12 per cent higher. The ratios of the average modulus of rupture of the poles to that of the clear material for two conditions of moisture is as follows:

Table 3.—Strength of Poles Compared on a Basis of 7-Inch Tops.

Species—	Seasoning condition.	Load at elastic limit. Aver., Lbs.	Load at elastic limit. Ratio to red cedar, Pct.	Maximum load. Aver., Lbs.	Maximum load. Ratio to red cedar, Pct.
Western red cedar	Cut green and air seasoned	7,800	100	12,000	100
Lodgepole pine	Cut green and air seasoned	8,000	103	11,620	97
Lodgepole pine	Fire killed 10 years	7,470	96	9,500	79
Engelmann spruce	Fire killed 10 years	7,500	96	9,400	78

Kind of poles—	As tested at 8 per cent.	As estimated* at 16 per cent.
Western red cedar	0.74	0.98
Lodgepole pine:		
Green cut	.60	.80
Fire killed	.60	.80
Engelmann spruce, fire killed	.48	.65

*On the basis that an increase in moisture from 8 to 16 per cent causes a 25 per cent reduction in strength.

CONCLUSIONS.

The tests on poles and specimens cut from them show that—

1. Air-seasoned lodgepole pine poles cut from live timber in Montana were fully equal in strength to the cedar poles tested. In actual stress developed they were superior, but on account of the greater taper of the cedar poles this advantage was lost in a comparison based on equal top diameters, the dimension usually specified.

2. Cedar poles were superior to the pine and spruce poles cut from a fire-killed area in Colorado in maximum load developed. The three shipments were, however, practically equal at the elastic limit. Were the native poles to be used in place of cedar without change of specifications, it would follow that the factor of safety would be reduced one-fifth for conditions at failure, but would remain the same for stresses at the elastic limit.

3. The fire-killed pine, after standing 10 years, did not show deterioration to any appreciable extent when compared to seasoned lodgepole pine cut from representative live trees in Wyoming and Colorado. The advantage in strength of the material from the lodgepole pine poles from Montana can be accounted for by the fact that it was above normal in weight—at least for lodgepole pine from the southern part of its range.

Table 4.—Results of Tests on Small, Clear Specimens Cut from Poles, Summarized by Species and Condition of Seasoning.

	Bending.								Compression parallel to grain.				Compression perpendicular to grain.		Shearing.	
Species and condition of pole from which cut.	No. of tests.	Per cent moisture.	Rings per inch.	Weight per cu. ft. (oven dry).	Fiber stress at elastic limit.	Modulus of rupture.	Modulus of elasticity.	Modulus of elastic resilience.	No. of tests.	Crushing strength at elastic limit.	Modulus of elasticity.	Maximum crushing strength.	No. of tests.	Crushing strength at elastic limit.	No. of tests.	Shearing strength.
				Lbs.	Lbs. per sq. in.	Lbs. per sq. in.	1,000 lbs. per sq. in.	Inch lbs. per cu. in.		Lbs. per sq. in.	1,000 lbs. per sq. in.	Lbs. per sq. in.		Lbs. per sq. in.		Lbs. per sq. in.
Western red cedar:																
Cut green and air seasoned—																
Average	105	7.9	16.9	22.3	5,997	9,305	1,185	1.73	56	4,825	1,373	6,540	61	538	78	959
Maximum	...	9.2	29.0	25.0	7,910	12,090	1,666	2.52	..	7,580	1,880	7,880	..	1,000	..	1,505
Minimum	...	7.0	6.0	18.2	3,120	5,280	615	0.53	..	1,990	640	4,350	..	300	..	525
Lodgepole pine:																
Cut green and air seasoned—																
Average	40	8.1	31.9	30.2	8,600	12,775	1,520	2.78	53	....	....	7,672	..	....	35	1,129
Maximum	...	10.1	49.0	34.5	10,660	16,080	1,985	5.14	..	....	....	9,780	..	....	..	1,735
Minimum	...	7.3	12.0	26.4	5,460	7,580	1,056	1.18	..	....	....	4,595	..	....	..	800
Fire killed 10 years—																
Average	41	7.8	26.1	25.9	6,145	9,049	1,217	1.75	37	5,278	1,361	6,486	42	740	28	1,148
Maximum	...	8.6	56.0	30.3	8,310	12,350	1,622	2.68	..	7,200	2,010	8,779	..	1,210	..	1,500
Minimum	...	6.6	13.0	21.5	3,280	5,190	822	0.73	..	3,000	890	4,560	..	402	..	660
Engelmann spruce:																
Fire killed 10 years—																
Average	54	8.0	35.1	23.3	6,163	9,045	1,194	1.80	35	4,585	1,208	5,696	54	621	40	1,142
Maximum	...	8.8	66.0	28.3	9,100	12,360	1,620	3.00	..	6,750	1,703	7,000	..	995	..	1,595
Minimum	...	7.1	19.0	19.8	4,260	6,050	850	0.87	..	2,030	840	4,650	..	377	..	555

4. The ratio between the strength of the poles and the strength of the clear material cut from them is not constant for the different kinds of wood. This "efficiency" factor varied from 0.74 to 0.48 of the strength of the clear wood when the comparison is made as tested, and from 0.98 to 0.65 when compared on the basis of values estimated to represent the same moisture condition in the small pieces as existed in the poles when tested. The values were highest for the cedar and lowest for the spruce, the pine representing an average for the three species.

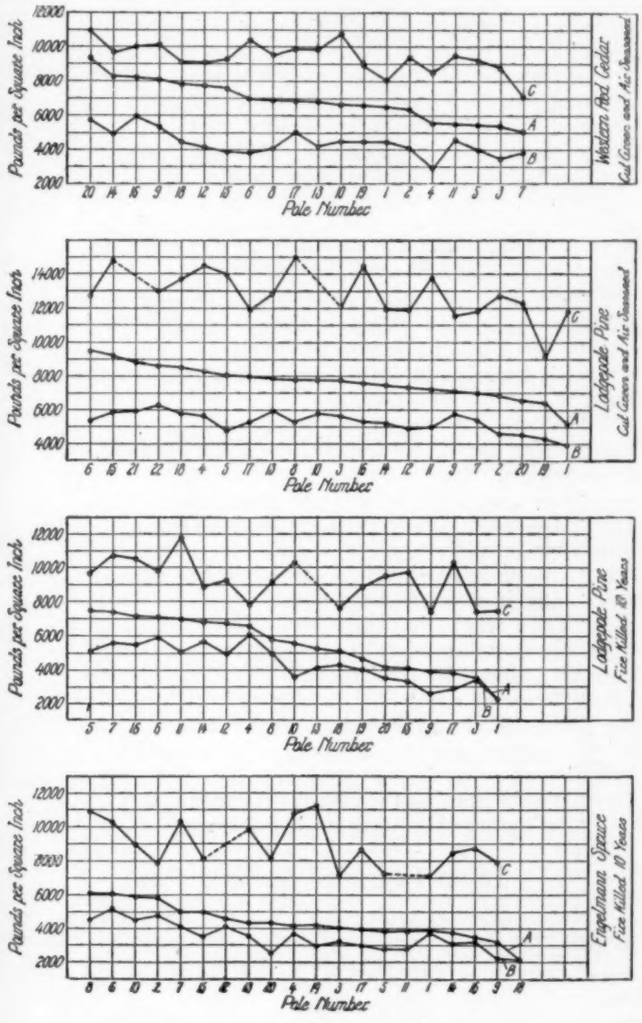
POLE TESTS BY THE PACIFIC TELEPHONE & TELEGRAPH COMPANY.

The Pacific Telephone & Telegraph Company made tests on 81 poles of western red cedar and Port Orford cedar at the pole yards of the Western Electric Company near Richmond, Cal. These poles were 25 and 30 feet in length, with 6, 7, and 8-inch top diameters, and 35 feet in length, with 7, 8, and 9-inch tops.

The method employed in these tests makes it im-

possible to make any accurate comparisons of stress values with those obtained in the Forest Service tests. In the telephone company's tests stresses are figured for the point of failure, while the Forest Service tests are figured for the load point or ground line, theoretically the point of greatest stress.

In the telephone company's tests the poles were tested horizontally, with 6 feet of the butt end of the pole held firmly between four 12 by 12-inch posts set in the ground. The load was aplied to the top of the pole, by means of a winch, at a rate of 1 foot per minute. A direct-reading dynamometer was placed in the line connecting the winch with the top of the pole. The top end



LEGEND.

A—Modulus of Rupture for Poles.
B—Fiber Stress at Elastic Limit for Poles.
G—Modulus of Rupture for Small, Clear Beams Cut from Tested Poles.

Fig. 8.—Relation of Fiber Stress of Poles and Modulus of Rupture of Small, Clear Beams Cut from Them to the Modulus of Rupture of Poles.

of the pole was supported on a dolly with truck casters which traveled on a piece of sheet iron, thus eliminating friction. Readings of the movement of a nail driven into the top of the pole were taken for each 100 pounds increment of load.

The Pacific Telephone & Telegraph Company has kindly permitted the use of its test data, and Table 5 is compiled from its report. Comparison of the equivalent top load in Table 1 with the top load for 7-inch by 25-foot poles in Table 5 shows a difference of only 5 per cent, while the calculated stresses are about 20 per cent greater for the Forest Service results. This difference, as already stated, is probably due to the different methods

Table 5.—Results of Pole Tests Made by the Pacific Telephone & Telegraph Company.

Top diameter, inches.	Length, feet.	No. of poles tested.	Weight of poles, pounds.	Weight per cubic foot, lbs.	Moisture, per cent.	Rings per inch.	Sap, per cent.	Top load at failure, pounds.	Modulus of rupture, lbs. per sq. in.
					Average values of				
WESTERN RED CEDAR FROM IDAHO.									
6	25	3	205	22.0	9.4	13.7	38.0	1,853	6,221
7	25	4	244	23.0	9.2	23.0	27.6	1,948	5,712
8	25	3	282	22.9	10.2	18.3	26.3	2,667	3,290
6	30	4	283	22.4	13.6	20.1	28.1	1,590	5,126
7	30	4	344	26.1	10.0	23.3	24.5	2,434	5,549
8	30	3	382	23.4	9.1	23.4	21.4	2,740	5,308
7	35	3	477	22.1	8.1	19.3	40.8	2,000	5,080
8	35	3	471	19.4	10.4	18.5	25.7	2,125	4,391
9	35	3	522	21.5	10.2	22.6	24.9	2,992	4,755
WESTERN RED CEDAR FROM OREGON AND WASHINGTON.									
6	25	3	204	24.1	8.7	24.4	41.6	1,470	5,525
7	25	3	213	19.8	15.1	6.6	41.2	1,625	4,481
8	25	3	238	19.8	18.0	9.5	30.1	2,072	4,816
6	30	3	255	21.7	17.0	7.2	36.8	1,352	5,784
7	30	3	240	18.8	7.4	9.3	33.3	1,597	7,006
8	30	3	395	22.8	15.4	11.3	29.2	2,385	3,146
7	35	3	331	21.1	9.2	8.0	32.7	1,712	6,408
8	35	3	546	24.6	34.0	6.8	38.2	1,888	4,349
9	35	3	597	24.8	11.6	24.3	17.4	3,257	5,665
PORT ORFORD CEDAR.									
6	25	3	256	31.3	11.6	16.3	...	2,027	7,616
7	25	3	315	24.8	10.7	25.6	...	3,277	7,896
8	25	4	460	26.6	13.3	10.3	...	3,740	6,058
6	30	3	375	24.3	8.6	15.3	...	2,518	6,817
7	30	3	397	25.2	20.5	15.0	...	2,790	7,332
8	30	3	441	24.0	9.6	14.7	...	3,577	7,824
7	35	3	585	30.4	10.1	9.0	...	3,123	6,851
8	35	3	591	28.1	9.7	21.0	...	3,057	6,928

used, both for calculating the stress and for supporting the butt of the pole.

Reference to Table 5 shows that there is no consistent variation when poles of the same top diameter but of different lengths are compared. However, Table 6,

Table 6.—Relation Between Top Diameters and Top Breaking Loads.
(Pacific Telephone & Telegraph Co.'s Tests.)

Length of poles—	Top diameter, inches.	Western red cedar from Idaho. No. of poles.	Western red cedar from Idaho. Average top breaking load, pounds.	Western red cedar from Oregon and and Washington. No. of poles.	Western red cedar from Oregon and and Washington. Average top breaking load, pounds.	Port Orford cedar. No. of poles.	Port Orford cedar. Average top breaking load, pounds.
25 and 30 feet.....	6	7	1,703	6	1,411	6	2,272
25, 30 and 35 feet.....	7	11	2,139	9	1,645	9	3,063
25, 30 and 35 feet.....	8	9	2,511	9	2,115	11	3,169
35 feet.....	9	3	2,992	3	3,257	..	....

compiled from Table 5, shows a very marked relation between top diameter and top breaking load in the three classes of poles tested by the Pacific Telephone & Telegraph Company.

Telephones in Gas Works

An investigation was recently made in Germany to determine whether any accidents had ever occurred in gas works by the ignition of gas with sparks from the telephone apparatus. No such accidents were reported, althought it was found that gas could be ignited if it were projected upon the instruments while these were in operation. Hence the Association of German Gas and Water Works has decided to permit the use of telephones in gas works, but requires that they be protected.

Pole Preservation by Kyanizing

Poles preserved by the Kyan process, *i. e.*, impregnated with mercury chloride (corrosive sublimate) solution, are now used to a great extent on the Continent, particularly near towns where their clean appearance and the possibility of painting them are important advantages. In southern countries in particular, kyanized timber is very popular. Where wooden poles are used to support electrical conductors of one description or another, it is important to realize great and uniform durability against attack by rotting and insect pests. The timbers which have usually to be considered in Europe in this connection are pitch pine, Scotch fir and larch, and it is important to ascertain whether kyanizing gives equally satisfactory results with pine and fir, and if not, what modification had best be made in the process to insure the best and most uniform results.

As is well known, the general process of kyanizing consists in steeping the air-dried timber for 14 days in a weak solution of corrosive sublimate (often as weak as 0.7 per cent of mercury salt). The nature of the wood is naturally of great importance in determining the quantity of solution absorbed; even assuming equal dryness of the timber prior to impregnation, pitch pine absorbs much less solution than Scotch fir, and this characteristic is noticeable in other impregnating processes as well as in kyanizing. Tests with solution of a number of metallic salts show that pitch pine absorbs about 0.4 times as much solution as Scotch fir in a given time but, in most cases, the impregnating solution is absorbed as such. Where mercury chloride solution is employed, however, the timber absorbs greater percentage of the salts than of the solvent, so that the solution soon becomes deplenished of chloride, and must be restored to the desired strength by the addition of strong mercury chloride solution. As a consequence of this selective absorption, it is not sufficient to record the amount of solution absorbed by timber during kyanization, the important factor is the actual amount of corrosive sublimate absorbed. It is a well established fact that air-dried pitch pine absorbs considerably less sublimate in a given time than does Scotch fir equally well seasoned, and since the durability of the timber in service depends on the protective action of the sublimate, it is necessary to secure equal proportions of the latter in the treated timber. Different timbers must be kyanized separately, and whereas seven days' immersion of air dried barked Scotch fir may suffice, at least ten days' immersion is required for the sufficient impregnation of pitch pine.

From observations made in connection with the kyanization of telegraph poles for the Austrian government, R. Nowotny says that 1 cubic meter of pitch pine timber absorbs about 1 kg. of corrosive sublimate in the course of 10 days' immersion in kyanizing solution. The same proportion of chloride was absorbed by Scotch fir during seven days' immersion, but by extending the impregnating period to ten days in the case of the pitch pine an equally durable timber was obtained. Naturally absorption proceeds more rapidly during the first days of immersion than towards the end of the impregnating period, thus whereas the average rate of absorption was 0.1 kg. of chloride per cubic meter per day in the case of the pine wood, the total absorption after seven days' immersion was 0.8 kg. per cubic meter.

Kyanization being a low pressure impregnating process, the penetration of the solution is limited to a few mm. depth from the surface of the wood and the salt absorption per unit surface area of the timber is therefore insignificant. It is found that pitch pine absorbs 0.033 kg. of chloride per cubic meter of surface area during seven days' immersion and 0.042 kg. during ten days' immersion, whereas Scotch fir absorbs 0.045 kg. per square meter of surface during seven days impregnation.

The above absorption data represents the highest degree of impregnation which can practically be obtained by kyanization and considerably lower degrees of saturation are frequently employed. For pine, an absorption of 0.6 kg. of sublimate per cubic meter (0.0375 lb. per cubic foot), *i. e.*, 0.03 kg. per square meter (0.0062 lb. per square foot) of surface is generally considered sufficient. The chief conditions for success are that the timber be thoroughly air-dried by prolonged stacking in such place and manner as to permit free access of air to the poles; and that the poles be completely freed from bark (the outer skin of the heart wood being also removed by the stripping tool) at least two months before the taking process. By varying the period of immersion, the absorption of the sublimate can be varied (up to a certain maximum), and timbers of various kinds can be rendered equally impervious to attack and decay.

Too Much Regulation

"Where's the president of this telephone company?" asked the man who called at the general offices.

"He's down in Washington, attendin' th' session o' some kind uv investigatin' committee," replied the office boy.

"Where is the general manager?"

"He's appearin' before th' Interstate Commerce Commission."

"Well, where's the general superintendent?"

"He's at th' meetin' of th' legislature, fightin' some bum new law."

"Where is the head of the legal department?"

"He's in court tryin' a suit."

"Then where is the general commercial agent?"

"He's explainin' t' th' Telephone Users' Association why we can't reduce th' rates."

"Where is the traffic manager?"

"He's gone out in th' country t' attend a meetin' o' th' grange an' tell th' farmers why we can't give 'em lines."

"Who's running the blame system, anyway?"

"Th' newspapers and th' legislatures."

In the Federated Malay States

The following table shows the development of telegraphs and telephones in the Federated Malay States:

	Length of overhead line, miles.	Length of overhead wire, miles.	Amount spent on construction.	Earnings.	Cost of maintenance.
1908	1,401	3,521	$ 48,646	$ 50,981	$34,064
1909	1,437	4,311	26,044	63,610	36,872
1910	1,556	5,135	79,995	95,512	41,055
1911	1,714	6,199	96,502	113,576	49,415
1912	1,921	6,934	125,260	135.316	76,252

During the year 371.983 telegrams were dispatched and 380,793 received. The revenue derived from telegraphs was $76,668 and the revenue derived from the 829 subscribers to the telephone was $58,708, making a total of $135,376. The number of telephone subscribers increased by 103 during the year.

The table above given includes 691 miles of telephone wire maintained by the department for the police, but does not include the wire maintained by the railway department for its own use. The post department also owns 242 miles of telegraph wire in Johore, not included.

Lawton T. Hemans.

Commission Regulation in Michigan

Address Before the Telephone Companies of Michigan

BY LAWTON T. HEMANS

OUR present-day civilization differs from that of a generation or more ago in nothing more than in the enlarged activities and increased comforts that have resulted from the introduction of our various public utilities. Transportation by steam and electric power; water under pressure; illuminating gas; light, heat and power from electric energy; the telegraph and the telephone, are largely the result of the inventive genius of the last half century. The very fact that we find it difficult to conceive a state of society destitute of the benefits of these facilities emphasizes their intensely public character.

Following centuries of precedent established in the world of individual industry and business, it was not strange that with the men and the corporations that built the first utilities there were strong feelings of resentment against any proposed qualification of the absoluteness of either their ownership or control. Up until almost the present, those in control of great public utilities have seemingly been able to see no difference between the merchant who sold hardware and the manufacturer who sold gas; between the man or corporation who sold shoes and the man or corporation who sold transportation, heat, light, power or the many other forms of energy or convenience to which the public utility has been applied. By slow degrees the knowledge has been diffused that there is a vast difference in the relation that exists between the investment and business of the so-called utility and the public,—and the relation which exists between the investment and business of the private citizen, and the public.

The modern public utility has become the answer to urgent communal necessity. In the universality of the want they satisfy they simulate the functions of government itself. Highways are no more necessary than railways, sewage systems no more necessary than systems for the supply of water, light, heat or power, or for the conveyance of human intelligence. Public utilities are not constructed except to the extent that they are invested with a sovereign power of government, either through the passage of enabling statutes, being given the right of eminent domain, or endowed with special privilege under municipal franchise. Both in the installation of their physical properties and in the service they render, public utilities partake of characteristics more nearly governmental than private in nature.

For the enlargement of the field of opportunity, for the stimulation of the individual initiative of its citizens and that the public might benefit from the thrift and providence of individual stewardship, government has surrendered to private capital the financing and creation of all the great public utilities, and has placed in the hands of its private citizens the duties and burdens of discharging functions that are entirely public in character.

Varied and interesting as are the many problems arising from this relationship, our only purpose is to bring out clearly the fact that as between the utility which private capital brings into existence, which the private citizens or corporation directs and manages, and the public which contributes to its support, the relation should be that of the copartnership; a copartnership in which the mutuality of interest, of obligations and responsibilities are clearly recognized and faithfully kept. Unfortunately this has not always been the actual relation, but it is the ideal towards which the best thought of the nation is tending. We are slowly progressing from the public service corporation that resented supervision and control, that looked upon the public as the legitimate object of exploitation, to the public service corporation that is beginning to understand its duties and obligations to its public copartner; that invests in its physical properties with the full consciousness that every dollar so invested is given a public character and charged with the mission of a public service; that invites the co-operation of its public partner through supervision and control by the public authorities, and whose officials recognize their public obligations, even though they act without oath of office or bond for the faithful performance of their duties. Likewise the intangible though no less real body called the public is beginning to understand its relation to this utility copartnership. It is beginning to ask through its legislatures and administrative commissions that it be not burdened by the economic waste incident to the duplication of public service facilities. It is beginning in places to scrutinize and to give greater protection to utility capitalization, and it is beginning to learn that for every hazard either to investment or revenue, it suffers alike with the private investor.

If the public utilities of the state would hasten the full acceptance of the industrial standards so necessary to the economic well-being of both utilities and public they will give to their public relations their first and greatest care. They will invite the most careful and searching scrutiny of their original investments. They will welcome the public to a full knowledge of all the facts incidental to their operations; they will give as much care to the maintenance of the efficiency of their properties and to the quality of service they furnish as they give to the earning of dividends. They will invite the public to give absolute safety, stability and permanence to investment, and for the lessened hazard they will compensate the public with decreased rates and bettered service.

These observations apply to all utilities, but with special emphasis to the telephone utility, for there is no utility whose service is so personal and intimate as that of the telephone. The very personal and intimate nature of the service at once leads to some of the most bitter criticisms to which the management of the utility as a whole is being constantly subjected, and emphasizes the absolute necessity for the full recognition of the management of every telephone utility of the public character of

its business; of the copartnership relation it sustains to the great public which in turn sustains it.

There is hardly a community that has not discovered that it can set poles, string wires, connect them to telephones and have a facility or contrivance that will "work." The exceeding simplicity of the equipment necessary for the transmission of the human voice between a few individuals and within a restricted area, and the little understood conditions that are encountered when the equipment and service is multiplied into a system serving even a populous city leads to many a contest alike hurtful to both utility and public.

Few realize the vastness of the facilities employed in rendering telephone service even within the state of Michigan. It will assist us and the public generally to comprehend the magnitude of the problem we are considering and the purpose to be served by our presence here, if we examine the figures which indicate something of the size of the telephone utility in our state.

From the best available statistics gathered from the various departments of state government, it appears that there is upon our streets and highways 51,000 miles of pole line. If we add to this the pole lines of telegraph and railroad companies we have a total mileage of 58,600, carrying 750,000 miles of wire. To the circuits which these lines provide there are connected 350,800 telephones; 205,000 of these telephones are the substations of the Michigan State Telephone Company, while 165,800 are the substations of companies independently operated. The value of this property can only be approximated. The State Board of Assessors has assessed, for the purpose of taxation within the state, 239 distinct telephone properties, giving them a valuation of $23,615,600; of which $16,500,000 was the value placed upon the Michigan State Telephone property and $6,530,600 upon the so-called independent companies, and $585,000 upon certain long distance toll line companies. These properties will contribute to the state government this year $509,591 in the form of taxes. The companies reporting show gross receipts to the amount of $8,348,824 and total expenses of $6,848,937. As between the Michigan state and so-called independent companies, the Michigan state shows total expenses of $4,155,421, or $20.27 per telephone, and the independent companies expenses to the amount of $1,724,032 or $10.30 per telephone. It is interesting to note that from a summary of these reports the total tax paid by all the properties was $1.45 per telephone. While these statistics are generalizations, not to be taken for the purpose of application to particular conditions, they nevertheless disclose the magnitude of the physical property and the extent of a service far beyond that ordinarily presumed. There are in the state, according to the best obtainable data, 1,147 persons, copartnerships, associations and corporations providing telephone service. Of this number, 297 are regularly incorporated bodies and 850 are either personal or mutual in their ownership and plan of operation.

It is this vast aggregation of property, serving daily as a means of communication between more than a million of people, that with certain other utilities has been placed under the supervision and regulation of the Michigan Railroad Commission. One will recognize the stupendous character of the efficient regulation of such a utility, even from the statistics quoted, though ignorant of the practical details involved. The commission, acting on the assumption that the various telephone utilities of the state fully recognize the public character of their service, and the copartnership character of their operations, has called this conference to further the efficiency and public benefits of the supervision and control which the commission exercises. The commission desires first of all to urge upon all the various companies of the state, and especially upon the smaller corporations and mutual organizations, that they can themselves render the commission most valuable assistance in the work of supervision and regulation. To do this they must understand that the purpose of supervision and regulation is not so much to do something to the various telephone utilities as it is to do something for them; and they must likewise understand that it is as much for the smaller company and for the association with the mutual organization, as for the largest and most powerful company in the state. There is a popular belief that the only province of the commission, in telephone regulation, is to hold a tight rein on the big fellow, but let me tell you a fact that may be of interest: There are in Michigan, as already stated, more than eight hundred small telephone organizations; some of them are regularly incorporated, but more are voluntary mutual organizations. They are all operated, primarily, for service among their members and not for profit. These companies or organizations serve from fifty thousand to seventy-five thousand telephones. The normal volume of complaints that reach the Michigan Railroad Commission from the subscribers of the companies and between such companies themselves is far greater than that received from the subscribers of all the large companies of the state combined. There are several reasons why this is so, but chief among them is the lack of organization and the spirit of co-operation between these organizations themselves. The complaints from the patrons of the companies mentioned are not generally of a serious nature, and the commission is quite generally able to bring about adjustments by giving to each of the contending parties a little more light on each side of the subject and enabling each to see the problem from the other's standpoint.

This emphasizes the need of organization and co-operation among this class of utilities. They are the first essentials to the regulation and supervision at once beneficial to both utility and public. The commission desires to receive the benefit of the composite judgment of the various companies, and especially of the weaker ones that are working out their own salvation. A great many of the smaller organizations are so small that they find the presentation of their grievances and answering of complaints against them a real financial burden.

The commission recognizes that it is charged with special duties in such cases, but it desires that such companies and associations shall have an advocate and a champion in their organization as well. Then through co-operation and organization, we want each of the smaller companies, and a few of the larger ones too, to profit by the experience of others. A very large proportion of the complaints and bitterness arising in the smaller organizations comes from a lack of knowledge as to the fundamental facts incidental to the business of furnishing telephone service. There is hardly a small telephone organization that is not perplexed by problems that have been long solved in some other portion of the state, but at present neither receives the benefit of the other's experience.

When we talk organization we are aware that there are those who begin to think of what the organization should be composed. There are those who would eliminate from such an organization all organizations larger than themselves, and there are those who would eliminate

from it all smaller than themselves, but we believe that whatever differences may divide the telephone interests of the state, and we recognize that there are such differences, we are persuaded that there are sufficient matters that are in common between them to bring all or nearly all together. The commission counsels this because it has the power, under the law, and likewise the disposition to protect the weak as against the strong, and the small as against the great.

Now the second purpose in calling this meeting is to urge a more general compliance with the provisions of the law regulating the utility as a whole. There are, as already intimated, more than a thousand telephone organizations in the state, operated by persons, co-partnerships, associations and corporations, with patrons ranging in number from a dozen to a thousand; but large or small, all are upon the highways, all desire long distance service, all wish protection when danger threatens, and nearly all, if not all, are under the legal obligation of furnishing service to such as desire service in the particular territory served. The law requires that such service shall be given without discrimination; that it shall be given at a like charge for like contemporaneous service. We all understand what discrimination means when it is practiced by a railroad company or by a large telephone company, but it seems very difficult for some to recognize it when it is practiced by a small telephone company, for a great many companies have one rate, and that a very comfortable one for the so-called renter who owns no stock in the company, and another and very much less rate for the subscriber who is within the circle of the organization as a stockholder or member. Every telephone utility has the right, and it is its public duty to charge a rate sufficient to pay cost of operation, depreciation upon the property, and reasonable return upon the fair investment. From this reasonable return, every stockholder, shareholder or member is entitled to a dividend representing a reasonable return upon his investment, but because the stockholder, shareholder or member happens to have from $35 to $50 which he has invested in a telephone venture, does not entitle him to the use of a telephone for a yearly assessment from $5 to $10 a year less than the price paid by his less fortunate neighbor for the same thing, and yet there are a large number of organizations doing business upon this plan.

From this plan of organization there are being constantly born a large brood of complaints. Stockholders, shareholders and members refuse to pay assessments when they cease to use the telephone. Stockholders not using telephones attempt to transfer their right to a telephone and to pocket the difference between the rental charge and assessment, renters paying the higher charge are constantly complaining of poor service and discrimination, and in the meantime only current cost is being provided, depreciation is ignored, service deteriorates and in time the community awakens to the fact that the property must be rebuilt with no funds at hand for the purpose.

Business principles and the law should be recognized. Discrimination should cease; companies should acquaint themselves with the cost of service; they should recognize that depreciation of the physical property is as much a cost of the service as the wages of the girl that sits at the switchboard. They should recognize that a reasonable return upon investment is likewise a part of the cost. If the companies wish to collect this charge in the form of an apportioned assessment, all well and good, but it should be alike to all, for this is justice.

The public is entitled to know the basis of the rates it is being required to pay for service. To this end it is necessary that there be information as to the value of the facilities employed, what is being done to maintain depreciation, and what items are being provided for in cost of operation, and what is being demanded as the reasonable return upon the capital employed. The ascertaining of these factors requires a scheme of accounts and reports to the Michigan Railroad Commission. The law provides for it; the commission prepares and supplies the blank forms for reports, but there are more than five hundred organizations giving telephone service that neglect and refuse to make any report whatsoever, and from the six or seven hundred that do report there are not to exceed fifty that give any information from which anything can be computed beyond the name of the organization and perhaps the extent of its lines and number of patrons served.

Citizens are being persuaded to invest their hard-earned savings in telephone companies upon the showing of large dividends paid, when, if actual depreciation upon the physical properties of the company was figured at one-half of what was actually accruing, the utility would show a deficit instead of a surplus. This is wrong in morals, is bad business, and is contrary to public interest, if not to the explicit provisions of the law. Every telephone utility in the state can and should make an intelligent report. If the blanks furnished by the commission are too complex for all companies, let us know it and we will get a more simple one. Let us get to an exact knowledge of our transactions. When we stop fooling ourselves we will find we are close together on many matters that now divide us.

As public utilities, the telephone companies of every kind owe it to the public to furnish good service at reasonable rates. What are reasonable rates involves a knowledge of all the cost factors, but good service involves conforming to something like a reasonable standard of efficiency in equipment and operation. To give it necessitates at least some approach to uniformity in practice. The state of Wisconsin has taken up and is attempting to perfect, with the full co-operation of the companies of that state, a simple standard that will result in something like system in telephone construction and service. The Michigan Commission desires the co-operation of the telephone interests of the state to the same end.

The law contains explicit provisions requiring every person, copartnership, corporation or telephone company operating telephone lines to have on file at its own place of business and with the Michigan Railroad Commission its schedule of rates, charges and tolls. This is an important provision of the law. Without it the volume of correspondence incident to regulation is greatly increased, the temptations to discriminate are multiplied, and, more than this, the purpose and express provision of the law are violated, but out of the more than eleven hundred organizations in the state rendering telephone service but five have complied with this provision. This information should be furnished at once.

As public utilities, telephone companies may not conduct their business as private concerns. They may not justifiably take from their patrons the returns which private business and speculative enterprise may justify, for, as already stated, if the law removes hazards from the business, the public is entitled to have the price of hazard returned in bettered service and lessened rates. It follows that it is the duty of every telephone utility to see

that the revenues it earns are actually received by the company, for if they are not, the burden is upon the public. The companies should consider the question of a uniform system for the collection of their revenues and adopt some system that shall operate free from discriminations with as light a burden and as great convenience to the public as possible.

In the beginning we spoke of the extent of the telephone property of the state, a property which in its total has a value of more than thirty millions of dollars. No other utility employs facilities so subject to obsolescence and depreciation as the telephone. The public dependent upon the facilities for service, and the stockholders investing their savings, are entitled to know that from the rates paid the properties are being maintained and that the yearly loss through depreciation shall be made good.

Naturally but a few of the matters growing out of the relation between the public and the telephone companies of the state can be presented in the time apportionable to an address of this character. The commission is anxious to serve the public in the adjustment of such problems as the telephone utility presents. Our faces are to the future and not to the past. We are here to urge you to organization and co-operation, not as this kind or that kind of a telephone company, but as telephone utilities of Michigan, and that you disarm criticism by the elimination of the conditions that have induced it in the past. Welcome the new order of things. Recognize the public character of your operations. Give as much thought to the public side of your business as to its financial side, and don't be afraid to beat the law, the courts and the commissions to the improvement of conditions that result in public benefits which in the end are company benefits as well.

Serving Half a Million by Telephone

One of the biggest private telephone systems used in connection with any one business in Chicago is operated by the Peoples Gas Light & Coke Company. The business which the company is enabled to transact with its more than half a million patrons over the telephone, requires the services of no less than eleven operators at the big switchboard and upwards of 100 assistant clerks, who work with telephone connections fastened to their heads in the customers' service department.

When a customer calls up the gas company and asks for information concerning a pending order, the setting of a meter, or a matter which requires the visit of a gas company representative, he usually gets an answer to his inquiry in less than one minute. Fifty seconds is the average time taken by the company to answer from six to eleven hundred telephone requests for information received every day in the year.

Practically all the data which the company needs as reference in connection with this vast business, transacted by telephone, is kept in filing cabinets. The information in these cabinets is duly classified and indexed and each and every section of every cabinet is in charge of a clerk working with a telephone receiver fastened to his or her head.

There are hundreds of cabinet drawers containing meter information—there are hundreds of others containing information covering visits to premises, and still more hundreds containing information covering pending and executed orders.

These cabinets all together cover almost one acre of floor space in the Peoples Gas building, and each and every clerk in charge of every section is busy constantly transmitting through the telephone fastened to his head, the data and information which he has at his finger tips.

These telephone clerks become so proficient in their work that mistakes are comparatively rare and an average of more than 30,000 calls per month are actually handled with less than one-tenth of one per cent error.

All the telephones used in connection with this wonderful service are, of course, linked up with department heads and with other telephones in the sales and operating departments throughout the city.

Orders received at outlying stores are transmitted by telephone to a force of clerks and telephone operators at the main office as rapidly as they are booked.

The very late orders are even transmitted to a night shift of operators and all these orders are duly made out and once more transmitted by telephone to the shops where the work is planned and laid out the same night for the workmen to take up the following morning.

In brief, the Peoples Gas Light & Coke Company has taken full advantage of the possibilities of the telephone to perfect a system of service to customers that is unexcelled in the business world.

Standard Specifications for Poles

WESTERN RED CEDAR.

The following are the revised official specifications of the Western Red Cedar Association, covering standard telephone, telegraph and electrical distribution system poles in sizes of 4 in. 20 ft. and upwards:

All poles must be cut from live, growing cedar timber, peeled, knots trimmed close, butts and tops sawed square, tops must be sound and must measure as follows in circumference:

POLES.

Top.	Circum.
4 in.	12 in
5 in.	15 in.
6 in.	18½ in.
7 in.	22 in.
8 in.	25 in.
9 in.	28 in.
10 in.	31 in.

CROOK.

No pole shall have more than one crook, and this shall be one way only, the sweep not to exceed one inch to every six feet in length. Same to be determined in the following manner: Measurement for sweep shall be taken as follows: That part of the pole when in the ground (six feet) not being taken into account in arriving at sweep, tightly stretch a tape line on the side of the pole where the sweep is greatest, from a point six feet from butt to the upper surface at top, and having so done, measure widest point from tape to surface of pole, and if, for illustration, upon a 30-foot pole said widest point does not exceed five inches, said pole comes within the meaning of these specifications.

BUTT ROT.

Butt rot in center, including small ring rot, shall not exceed 10 per cent of the area of the butt. Butt rot of a character which impairs the strength of the pole above the ground is a defect.

KNOTS.

Large knots, if sound and trimmed smooth, are not a defect.

DEAD OR DRY STREAKS.

A perfectly sound, dead or dry streak shall not be considered a defect when it does not materially impair the strength of the pole.

Traffic Studies of Automatic Systems

Paper Read Before the American Institute of Electrical Engineers

BY W. LEE CAMPBELL

The paper describes a telephone traffic recording machine by means of which not only the number of calls for a given period, but also the average duration of each call, is mechanically registered on a moving tape. The observations recorded here were taken on an automatic telephone system. The graphical record shows the exact duration of each connection, the number of connections made during a given interval, and the number of simultaneous connections in service at each instant. By means of these records it is possible to study the relative efficiency of small and large trunk groups, the average holding time of calls, and these observations permit the switches and trunks to be so arranged that the calls will be evenly distributed among the trunks in each group.

THE word "traffic" as used in telephone practice applies to the volume of calls which a system handles. To measure traffic it is necessary to know not only the number of calls for a given period or interval of time, but also the average duration of each connection or call. A knowledge of traffic, and the laws governing it, is essential to the proper design and operation of either an automatic or a manual system.

In well managed manual switchboard central offices it is customary to study traffic conditions by taking peg counts and plug counts. A peg count is a count of all connections made during a definite time interval by each of the operators. A plug count is a count at a definite instant of all plugs in use. In addition to these, stop-watch observations must be made to determine the average length of connection, or "trunk holding time," as it is often called. Where the trunk holding time is known, a good way to take both a peg count and a plug count has been to use a record ammeter connected into a circuit supplying energy to some or all of the relays; then knowing the average ampere-hours consumed by each connection, it is a comparatively simple matter to determine from the ammeter records both the total number of connections made and the maximum number of connections existing at the busiest instant. The latter is an especially important matter because it determines the amount of connecting equipment required to take care of the peak load.

It is very difficult, if not impossible, to secure a very accurate peg count or plug count. Operators frequently make mistakes in registering calls during a peg count and observers make mistakes in counting plugs; mistakes are also made in distinguishing between cord circuits actually in use and those which are apparently in service, but really idle, because the conversation of the parties using them has been completed.

In automatic central offices, counts corresponding to peg counts are occasionally taken by counting the operating switches as they complete connections. Calls are also counted by the use of a meter on each trunk; these are generally installed by connecting the release magnets of 2d or 3rd selector switches on each section of the switchboard to a separate busbar, in series with which is a ½-ohm relay which operates each time a switch releases and closes a circuit through a meter. Counts similar to plug counts have been taken by counting all of the like trunking switches in operated position at given times.

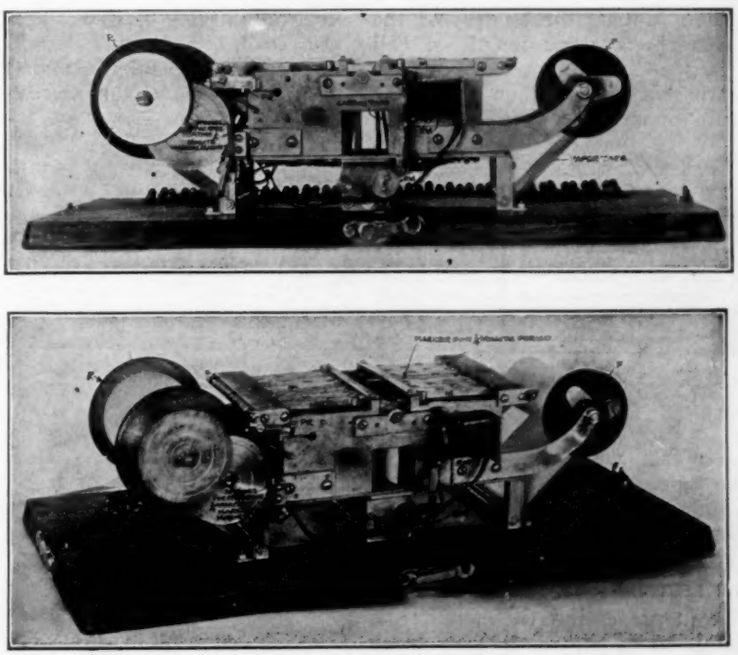


Fig. 1.

TRAFFIC-RECORDING MACHINE

All of these methods of measuring traffic have their disadvantages and it is believed, therefore, that telephone traffic engineers and telephone engineers in general will be interested in a new recording device and some of the results secured by its use during the past year in making traffic studies in automatic switchboard plants, on a somewhat elaborate scale. The special feature aimed at in this machine was to secure a graphical record which would show the exact duration of each connection, the number of connections made during a given interval and the number of bona-fide simultaneous connections in service at each instant.

The machine as devised consists of a mechanism for passing a strip of paper about 6 in. (15.2 cm.) wide over an inked ribbon and onto a receiving roll at definite rate of speed, with a number of markers (40 in all) arranged side by side over the paper, so that when any marker is pressed against the paper the inked ribbon leaves a corresponding line on the paper. Each marker is provided with an armature and an electromagnet for operating it; the latter is electrically connected to the mechanism associated with one automatic switchboard trunk in such a way that whenever that trunk is occupied by a call, the potential established on the trunk for guarding purposes serves also to cause current to flow through the electromagnet and energize it as long as the connection lasts.

Two views of this machine are shown in Fig. 1. *F* is the roll feeding paper to the machine; *R* is the receiving roll; *M* are the markers; *V* is a pendulum vibrator tuned to run at a fixed speed, so as to make and break at regular intervals the circuit through the electromagnet operating the step-by-step pawl and ratchet movement *P R*, which turns the receiving roll and thus draws the paper through the machine; *R M* is a device for moving the ribbon at intervals so that the portion immediately under the markers will always be sufficiently inked. A skeleton view of the mechanism with its associated circuits is shown in Fig. 2.

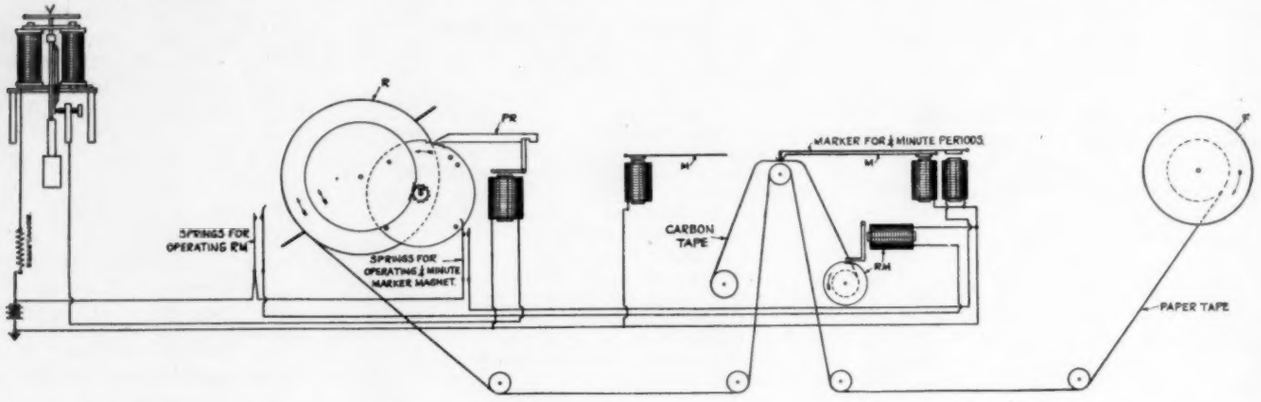
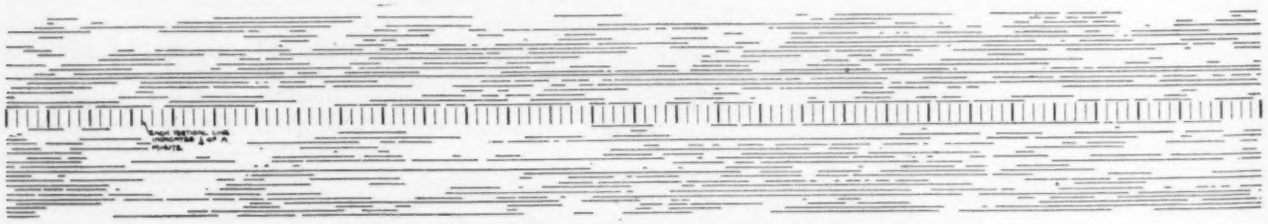


Fig. 2.

A section of the paper tape taken from the machine and covering a record of calls during a busy half-hour on a set of trunks in the business central office of a city in Michigan is shown in Fig. 3.

One especially interesting feature is the remarkably short period of time which occurred in many instances between the release of a trunk and its seizure for another connection. This is of material aid in promoting trunk efficiency, and is due to the automatic switchboard. As indicated in the figure, vertical lines mark ¼-minute periods. It was found that by means of a chartometer it was not a difficult matter to sum up the lengths of the lines on each tape, so that the average length of call might be obtained; and it is apparent that a curve may be very readily made from this sheet, which will show the number of simultaneous connections at each instant, as the curves in Fig. 4. In fact, any traffic data desired may be secured from the tape.



SECTION FROM TAPE OF TRAFFIC RECORDING MACHINE

Fig. 3.

The upper curves *A* and *B*, in Fig 4, are taken respectively from the upper and lower halves of the same tape, from whose totals the lower curve was constructed.

TRUNK EFFICIENCY.

The writer's purpose in presenting these curves is to give a graphical illustration of the relative efficiency of small and large trunk groups, by noting the fact that while in the group *A* the maximum number of simultaneous connections is 18 and in group *B* the maximum number is 18, the maximum number in a combination of the two is not 18 plus 18, but 32. This is merely an illustration of the law of increase in efficiency of trunks as the size of the group increases, which has been well known to telephone engineers for years; but the author is not aware of any other device which makes it possible to study the working of the law so satisfactorily. The fact that the greater efficiency of large trunk groups is due to a smaller ratio of peak load to average load is very clearly demonstrated by the curves in Fig. 5, which were constructed from data secured in an office of 7,950 lines, by making simultaneous observations during the busy period of each of six working days, on the number of connections in service at given instants in each 100-line section of the entire plant. Note the much greater variation (Fig. 5) in the percentage of connections in the average 100-line group than in the 1,000-line section, and the very small variation in the load of the entire plant.

It is customary to define the peak load in terms of the average load or the total busy-hour load. One of the curves, *A* in Fig. 6, shows, for calls of 83 seconds' duration, the relation between the total busy-hour load and the peak load, in automatic switchboards; or, in other words, the number of trunks needed at the peak instant for busy-hour loads of various sizes. This curve follows the formula:

$$\text{Number of trunks} = T\,C + 3.785\,(1 - T)\,\sqrt[3]{C\,T} \quad (1)$$

For call lengths of less than 130 seconds this formula may be written in the simplified form:

$$\text{Number of trunks} = T\,C + 3.7\,\sqrt[3]{T\,C} \quad (2)$$

T is the average holding time in hours, and *C* is the number of busy-hour calls.

AVERAGE HOLDING TIME

The curve *B* in Fig. 6 is drawn for an average holding time of 83 seconds, because some tens of thousands

of observations made in different automatic plants show this to be slightly above the average duration of connection. The 83-second standard is divided as follows:

Setting up of automatic connection	6	seconds
Waiting for called party to respond	9.5	seconds
Conversation	66.5	seconds
Release of connection	1	second
Total	83	seconds

Call lengths vary greatly in different offices. For example, in one of the cities in which studies were made with the traffic recording machine it was found that while the average length of calls for the entire system was 81.25 seconds, it was 130 seconds on the trunks to an outlying residence office and 100 seconds on trunks to manual private-branch exchanges; but observations made on inter-communicating calls in automatic private-branch exchanges have, in a number of instances, shown an average call length as low as 43 seconds.

In connection with the studies of average call length, it was found that in approximately 12 per cent of the calls the calling party received the busy signal, and 16 per cent received no response from the called party, either because he was beyond the reach of the telephone, or did not answer the signal before the calling party disconnected.

TRUNK GROUPING

It is common practice in automatic switchboard systems to arrange the switches and the trunks so that the

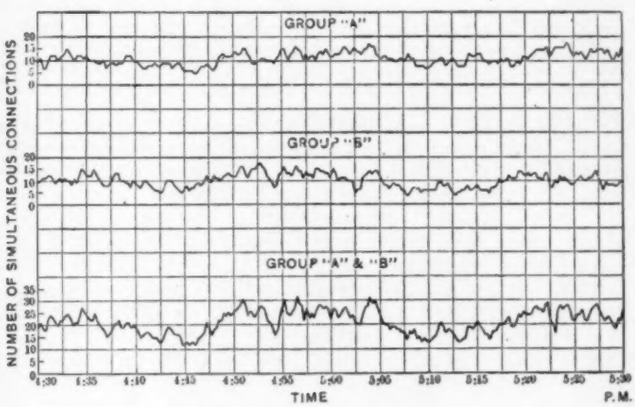


Fig. 4.

calls will be evenly distributed among the trunks in each group. This is done to distribute the wear on the trunking switches, to ensure all the switches enough operation to keep them in good working order and to reduce the risk of two parties seizing a trunk at the same instant. Sometimes it is advisable, however, to provide that the trunks in a group will be selected successively. For example, if there are 10 trunks in a group, the trunk-selecting mechanism will test the trunks in order, starting at No. 1 for each call, and seize the first trunk that is disengaged.

In Fig. 6*a* are shown some curves showing results of observations made with the traffic-recording machine on groups of trunks successively selected. The shape of these curves gave rise to the suggestion that two groups of 10 trunks each, for example, might be reduced without loss to two individual groups of 7 trunks each and a common group of 3 trunks, which would be a total of 17 trunks instead of 20, by connecting in multiple the 8th, 9th and 10th trunks of each group after the manner shown in Fig. 7. The effect of this method of connecting the groups together is illustrated in Fig. 8, which shows the lead curves of the two groups of trunks overlapped in such a way that the one busy-hour call of the 10th trunk in each group is superimposed on the 9 busy-

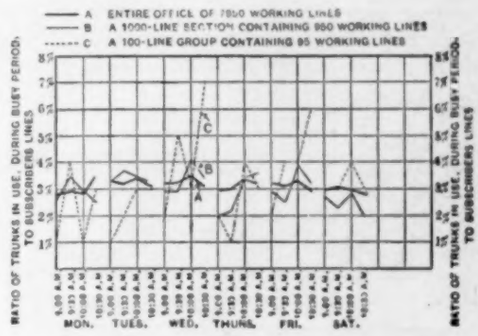

A ENTIRE OFFICE OF 7850 WORKING LINES
B A 1000-LINE SECTION CONTAINING 950 WORKING LINES
C A 100-LINE GROUP CONTAINING 95 WORKING LINES
RATIO OF TRUNKS IN USE, DURING BUSY PERIOD, TO SUBSCRIBERS LINES
MON.
TUES.
WED.
THURS.
FRI.
SAT.

Fig. 5.

hour calls of the 7th trunk in the other group, while the 3 busy-hour calls of the 9th trunk in one group are combined with those of the same trunk in the other group.

It is argued by those who suggest this scheme that since, as shown in Fig. 6, a group of subscribers *A* making 175 busy-hour calls would require but 10 trunks and a similar group *B* would require but 10 trunks, while a group of subscribers making 350 busy-hour calls would require but 16 trunks, the arrangements in Fig. 8 satisfies all requirements, because it must be true that the peak loads in the two sets of 10 trunks each would practically never overlap, so that both groups of subscribers would never want the 3 common trunks at the same time, or else the curve in Fig. 6 and the law governing it are fallacious. There is one other factor to be considered, however, and that is the possibility of calls overhanging on the 3 common trunks, while some of the subscribers of the group *A*, for example, are not calling, and group *B* parties are endeavoring to secure access to the common trunks. The arrangement in Fig. 7 and Fig. 8 allows an extra trunk to overcome this objection, *i. e.*, allows 17 trunks for 350 busy-hour calls, while but 16 would be required if all subscribers had access to every trunk.

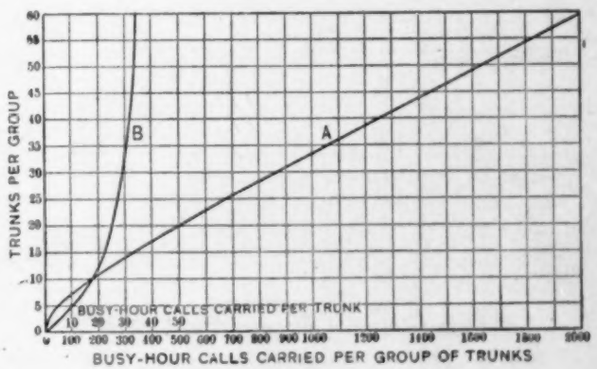
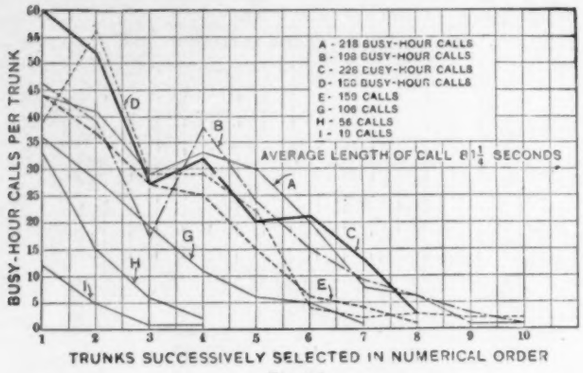


Fig. 6.

Curve A shows relation between the number of busy-hour calls and circuits in a group. Average holding time 83 sec. Automatic system.
Curve B shows the relation between the number of circuits in a group and the number of busy-hour calls carried per circuit.

Whether this arrangement will be justified by experience and become of practical value, the writer would not venture to say at this time. It seems probable that it could be practiced to advantage where two-way trunk

service is to be given. As the writer mentioned in a previous paper, there is generally a difference in the times at which the peak loads occur on trunk groups carrying traffic in opposite directions between two offices, consequently the use of two-way trunks would reduce the number of trunks required. While such trunks have not been found feasible between large manual offices, they are nevertheless practical, and some of them are in use in automatic systems.


A - 218 BUSY-HOUR CALLS
B - 198 BUSY-HOUR CALLS
C - 226 BUSY-HOUR CALLS
D - 166 BUSY-HOUR CALLS
E - 159 CALLS
G - 106 CALLS
H - 56 CALLS
I - 10 CALLS
AVERAGE LENGTH OF CALL 8 1/4 SECONDS
BUSY-HOUR CALLS PER TRUNK
TRUNKS SUCCESSIVELY SELECTED IN NUMERICAL ORDER
Fig. 6A.

The obstacle in the way of their more general installation is the increased cost of trunking equipment. This obstacle can be largely eliminated by the scheme illustrated in Fig. 9, which shows 16 trunks inter-connecting two offices *A* and *B*, in such a way that each office has access to six individual one-way trunks and four two-way or common trunks. This plan allows for a peak load in either direction of 175 busy-hour calls, provided the two peaks do not occur at the same time, and the combined group would carry a load of at least 240 calls.

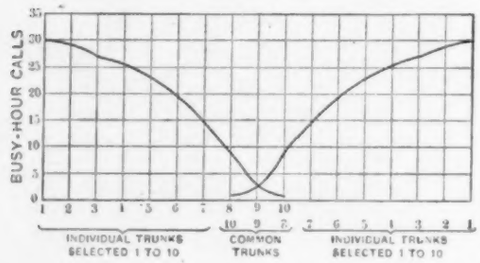


Fig. 8.

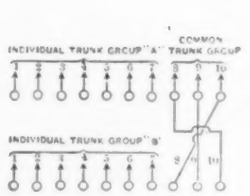


Fig. 7.

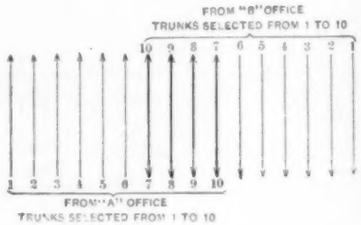


Fig. 9.

It is evident that the number of common trunks might be greater or less than four in a total of 20, and would be determined by the relation between the two-way peak load and the peak of the load in each direction; also that the expensive two-way equipment is confined to the comparatively few two-way trunks.

Question on Underground Cable

Editors TELEPHONE ENGINEER:—We have a village telephone exchange and we have many trees where our lines are. We must put in cable and best probably underground. It seems to be the custom or method to dig a trench a foot or two deep, to lay the lead covered cable on the earth in the bottom of the ditch, then some tar paper on the cable, then two inches of cement on top of the paper and then fill in with earth. A careful map or blue print of the position of the cable is kept. It is said to give good service and need small repair. Lightning arresters must be kept in order.

Do you know anything about this arrangement? In case of fault or lightning injury, is there any sure way of measuring or calculating where the trouble is? Could one of these so-called "Telefaults" locate the trouble, say while placed two feet from the cable, or would the cable have to be dug out to find it? We understand all about the Wheatstone bridge and all connected therewith and know that there are many conditions that may interfere with its use. Please tell us about it in the TELEPHONE ENGINEER as soon as may be and oblige us and probably many other readers.—C. S. M.

ANSWER BY THE SERVICE DEPARTMENT OF THE INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA.

This party desires to replace his open wire construction with cable and is interested in the method of laying it in a trench covered with a layer of cement for protection. I would not encourage this method of laying cable in any instance, and particularly as he intends to use it.

In a small exchange cable is necessary only for entrance to central office and base lines, and if exchange is large enough to have underground at all, the system should have more flexibility than laying cable in the ground without conduit. Especially if the exchange grows to any extent, it is always necessary to have your conduit system such that you can increase by replacing small cables with larger ones and using replaced cables again. Of course local conditions and the size of the plant govern largely whether it requires cable at all, and if so, whether it should be aerial or underground.

Plants up to about 800 lines entering an office should be maintained aerial if possible, and the base lines extended to points limiting aerial leads to as small number of arms as possible. Over 800 lines, it begins to be a problem to maintain aerial entrance to your central office, and underground should not be extended any further than the ends of base lines by extending several laterals rather than extending underground to aerial with a few large cables. I would not recommend installing cables using method as suggested except extensions of laterals from the regular underground base lines, where the chances are that there will be no change occur for some length of time.

Answering the questions following the description of method suggested, it is very essential that exact data be kept on record pertaining to any system of underground construction, both as to lateral location and depth, also the number of ducts installed and what make, location of manholes and laterals leading therefrom, etc.

Regarding the stability and maintenance cost of such a method, in smaller towns where they have no street railway systems which use the ground as a return, they would not be bothered with electrolysis, but where there would be liability of interference of this character, cable laid in this manner would be more apt to suffer than installed conduit.

It is very essential that lightning arrestors be kept in order for the protection of cable. It very often occurs that when a trouble man finds the carbons have arched across the dielectric, putting the line out of order, he thinks he saves himself work and the company expense by removing them. This is a serious mistake to make as is evidenced by the fact that the carbon has performed the function it is designed to do, showing that foreign current has come in over the line, and if carbons are not in place, it is very apt to injure cable.

Regarding the method of measuring and locating cable trouble, in smaller plants, the Telefaults are very efficient and will often locate trouble in underground runs of various number of ducts. Where there is a single cable to deal with, as is sometimes the case in underground and aerial construction, trouble can be located within a few inches. The larger companies use the Wheatstone bridge only for the purpose of locating underground trouble and cables located in iron pipe. It is impossible to locate cable trouble with the Telafault when the cable is run in iron pipe.—F. L. E.

The Telephone Scrap Book

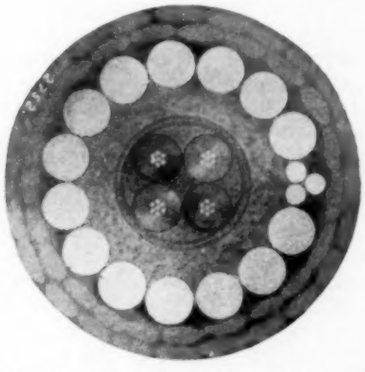
Curious and Useful Items, More or Less Telephonic, Gathered from Everywhere

The Anglo-Irish Telephone Cable

THE new Irish telephone cable, which is to serve as the main trunk route between the southern half of the United Kingdom and Ireland, is the longest submarine loaded cable yet laid by the British postoffice department, says the *Postoffice Electrical Engineers' Journal*. Its total length is approximately sixty-four nautical miles, being thus some sixteen nautical miles longer than the Anglo-Belgian cable, which was laid in 1911. In several respects the two cables are similar in construction; the dielectric in each consists of the specially treated guttapercha patented by Messrs. Siemens. They are both loaded on the transformer and phantom circuits, with coils spaced one nautical mile apart; the 7-wire copper strand forming each of the four conductors weighs 160 pounds for nautical mile, and the dielectric 150 pounds in both cases. The over-all weight of the completed cable is some 12½ tons per nautical mile. Where the coils come in, the cable is strengthened by extra sheathing for about 92 feet. The following are the particulars:

Length of double sheathed portion	92 feet
Weight of the 92 feet	8.0 cwt.
Weight of 92 feet of ordinary cable	3.85 cwt.

A special feature of this cable is the provision of a fifth core of 50 mils copper G. P. insulated, which runs



Section of New Anglo-Irish Telephone Cable. Full Size.

in the center for half a naut. at each end of the cable. It is then brought out by means of an insulated iron strand, which is bound in and soldered to the sheath. This wire has been provided as an earth wire in connection with experiments on single-wire submarine telephone cables, which are at present being conducted. The object of the length of half a naut. is to permit of the earth wire being taken out to sea and soldered to the sheath, so as to avoid the inductive disturbance which is generally found, to a greater or less extent, when earths are made in a cable hut, especially when telegraph cables are terminated in the hut.

The value of the attenuation constant β was specified not to exceed .016 per naut. when the transformer circuits and superimposed circuit were tested with a sinusoidal electro-motive force, having a periodicity of 800 per second, applied directly to the end of the cable, and producing one milliampere at the sending end.

The results obtained on the completed cable were as follows. A "Franke" machine was used for the tests.

TRANSFORMER CIRCUIT.

Angular Velocity ($2\pi n$) of Testing Current.	Attenuation Constant β. Mean Values. Modulus.	Characteristic Impedance Z_0. Angle.
3,000	0.0138	665	—5° 45′
5,000 Ø	0.0150	690	—2° 40′
7,000	0.0168	695	—2° 40′

ØSpecified angular velocity.

SUPERIMPOSED CURRENT.

The attenuation constant when $2\pi n$ equals 5,000 is 0.0150.
The characteristic impendance Z_0 equals 446 0° 52′.

The transformer circuits (the two diagonal pairs) have thus a standard cable equivalent of approximately nine miles.

The efficiency of the coils is such that, when taken separately, the ratio of the effective resistance (R) to the inductance (L) in each case is $\frac{R}{L} = 48$

The constants of the completed cable per naut. loop are as follows:

	Resistance of Circuit Without Coil.	Resistance of Coils at $2\pi n = 5{,}000$.	S/K	Inductance (Millihenries).	Wire-to-Wire Capacity (mfs).
Transf'rmer circt's.	14.2Ω	6.8	15	100	0.166
Superimposed circ't.	7.1Ω	3.2	15	50	0.320

Where S is the leakance in mhos and K is the capacity in farads.

Overhearing was specified on the completed cable between either of the transformer circuits and the superimposed circuit to be not greater than would be observed in direct speech over 65 miles of standard cable having a resistance of 88 ohms per mile loop and a wire-to-wire capacity of .054 microfarads. The figure of 65 miles was stipulated because a similar result was obtained in the Anglo-Belgian cable, and it was feared that a higher figure could not be guaranteed.

The copper conductors are of 100 per cent conductivity to E. S. C. standard for annealed high-conductivity copper. The sheathing wires, fourteen in number (with an additional 3-wire strand to indicate that the cable is a loaded one), are made of the best selected ball furnaced "all wire" pig iron, specified to have a strength not less than 23 tons per square inch and well galvanized with zinc spelter. Experience has shown that iron of this type is less subject to corrosion than the homogeneous iron which was formerly used by the postoffice.

Each completed set of loading coils, with their insulated covering and before jointing into the cable, was subjected to an external hydraulic pressure of 15 cwt. per square inch for not less than half an hour without producing distortion or other injury. The cable was constructed by Siemens Bros. in the works at Charlton, Woolwich.

Aerial land lines of 600 pounds copper have been run from the respective landing points to Manchester and to Dublin in order to secure a high standard of speech on the circuits.

An Amateur Wireless Telephone

THE transmission of articulate speech without wires has for many years held the attention of the leading scientists of the world. Of the numerous systems described in the scientific press, few are adaptable to the wireless experimenter. The following is a description of a very simple and inexpensive wireless telephone that can be made by those owning a wireless station, by E. M. Nielson in *Modern Electrics and Mechanics*.

If we produce a rapid train of almost undamped oscillations separated by an interval of time very small in comparison with the duration of each group, by varying from instant to instant the energy of a wave in accordance with the variations of air pressure acting against a transmitter diaphragm, a transference of such energy variations is effected between two stations. The voice current waves superimposed on the transmitting wave will actuate a receiving device, such as is used in all wireless stations, in accordance with the spoken words at the sending station.

Earl Hanson and Professor Twining of Los Angeles have sucessfully used the system they devised, and numerous stations in Southern California have been using the system with the connections shown in the accompanying diagram. AA^1 is a source of 60-cycle current. BB^1 are choke coils to keep the high frequency current from being kicked back into the lines AA^1. They are made by winding 50 turns of No. 10 cotton-covered copper wire over a core of soft iron wire. Current passes through choke coils to primary C of any sized transformer, thence by induction to secondary D. Shunted across the secondary is a micrometer carbon gap E. One terminal of the gap may be water cooled, as shown by the tub of water F. Leads are taken from this gap to condensers GG^1, each made of four plates of 10x10 glass. One terminal of the condenser G^1 connects with a transmitter of any make M, then through the transmitter and primary of an oscillation transformer to the other condenser terminal G. The transmitter can be put in the aerial lead, ground, or as a shunt around the secondary of the oscillation transformer.

Mr. Hanson and Professor Twining have attained surprising results with this 60-cycle a. c. telephone and

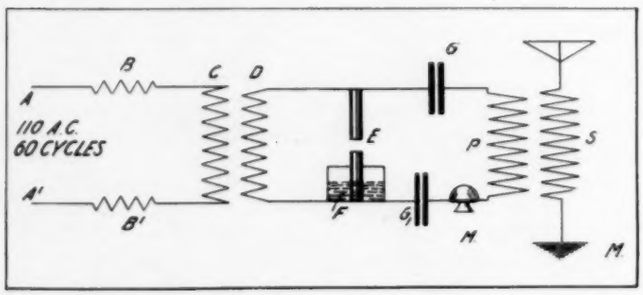
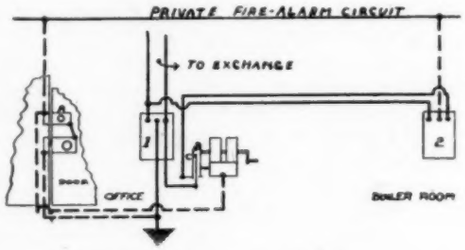


Diagram of Amateur Wireless Telephone.

amateurs throughout the country can communicate with each other by this same simple means. It may be well to state here that a number of transmitters can be connected in parallel or multiple series and connected to a common mouthpiece, thereby allowing more power to be used. Again, very little insulation will be required, as the gap, being of a micrometer size, eliminates high potentials. A key may be used instead of the transmitter M, and a number of gaps in series substituted for the single one shown at E.

Ringing Circuits for Party-Line

WE have central-energy telephone service to our power plant consisting of one metallic circuit with grounded ringing, explains Roy W. Eves in *Electrical Review*. There are two instruments on the line, one, No. 1, in the chief engineer's office, and the other, No. 2, in the boiler room. It is desirable that the bell of No. 2 shall not ring when there is anyone in the office to answer at No. 1; but that when the office is closed, which is all



Party Line Ringing Circuits.

night and frequent intervals during the day, that the bell on No. 2 shall ring in order that the call may be answered. It is also desirable to have some method for signaling No. 2 in case someone wishes to converse with an employe in the boiler room, but is answered from the office. The sketch shows the result of an effort to meet the conditions without the expense of running another line to the boiler room from the office, or the use of switches which would depend upon someone remembering to close them at certain times or under certain conditions. The only extra wiring necessary is shown by dotted lines.

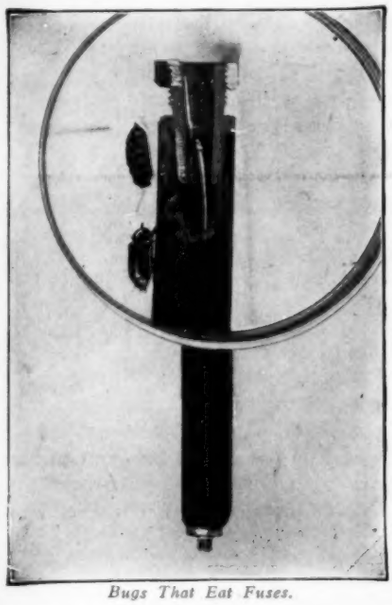
The two locks on the door at A are arranged so that when the spring-lock is closed the private fire-alarm line is grounded. As the ground wire has been taken off No. 2 and a tap from the fire substituted, No. 2 telephone will ring only when lock A is closed, that is, when there is no one in the office. When the office is occupied and a call comes for someone in the boiler room, only the office bell rings, in which case the party answering turns the magneto in the office. This magneto is one that was taken from an old telephone. When the crank of the magneto is turned it moves to the left, thereby closing contacts B and opening C, thus disconnecting the right-hand wire of instrument 2 from the rest of the line and throwing the ringing current to the two right-hand binding posts of No. 2, which are the proper ones for ringing. When the crank is released the contacts resume their normal position, thus disconnecting the magneto entirely from the line and completing the telephone circuit through C.

Having to ground the private fire-alarm wire has proved to be an advantage, as now whenever another ground occurs on the line, an indicator bell rings when the line is grounded for telephone purposes.

In addition to that at Epsom, there are now eleven other automatic exchanges in course of erection or on order. The largest, at Leeds, which will be opened early next year, will be built for 15,000 and equipped for 6,800 lines. The other towns where automatics are being installed are Accrington, Chepstow, Darlington, Dudley, Grimsby, Hereford, Newport (Mon.), Paisley and Portsmonth. Several new manual exchanges are being built in London for 10,000 lines each.

Wanted: Non-Edible Fuses

FOR years, in the electrical world, troublemen have been called "bug hunters." Just how this term or nick-name originated had never been thoroughly understood until a short time ago, when some conscientious troublemen of the Western Electric's Denver shop, in the course of investigating complaints that had been received from troubled subscribers of the local telephone company, made a discovery that fully justifies their peculiar nick-name.



Bugs That Eat Fuses.

After several attempts, they succeeded in capturing, with the aid of a pair of eight-inch pliers, a screw-driver and a couple of pins, the originals of the accompanying photograph from the *Western Electric News*.

These are beetles, of a kind known colloquially as "lead-eaters." On close inspection of the picture, it may be seen where they have actually eaten the lead or fuse wire in a No. 7-A pencil fuse, which had been their dwelling place, thus destroying the fuse, opening the circuit to the telephones, and causing a number of complaints of interrupted service.

Bonding and Grounding Aerial Cables

WHILE electrolysis proper does not attack aerial cables, it is equally important that these cables are bonded and grounded in the same manner as for underground work, says George Littel in *Popular Mechanics*. The large number of high-potential circuits which run parallel with and across the telephone, telegraph, light and power cables makes the bonding and grounding necessary. The high-potential wires often drop upon the cables below and the current jumps through the underground fuses, runs down into the underground cable and makes its way through to the heat coils on the mail distributing frame in the central station. Also, in damp weather, where the high-potential circuits and the telephone cables are on the same poles, the induction will often seriously interfere with the proper working of the latter. Lightning also is liable to damage aerial cables, and for these three reasons the aerial cables must be properly protected, as an accident may come to them at any time. The following instances of troubles caused and diverted by improper and proper insulation of cables show that too much care cannot be taken to reduce the maintenance expense.

In one instance the cable was struck by lightning, which jumped through the underground box, followed down the cable, and finally, about a half mile from the underground box, jumped through the sheath to the ground. The interesting part of this case was that the lightning had confined itself to one pair of wires all the way in the cable until it went to ground, where it fused off about seventy-five pairs of wires and burned a hole in the sheath about the size of a lead pencil. The second case occurred in a cable that ran parallel with an interurban trolley feed and on the same pole with it. In this instance the aerial was properly bonded and the damage was limited to that part of the aerial between the start of the trouble and the ground connection. The feeder dropped across the aerial and melted the armor completely for over 300 feet, but there was not one single station, out of over fifty party lines, that was put out of commission. It can be readily understood that the lack of bonds and ground in the first case caused a large repair expense, and that the proper bonding and grounding, in the latter, saved twice as much as otherwise would have been destroyed.

When cables are run across iron bridges, the best plan is to insulate them at both ends. This can be easily accomplished, even though the cable is run in an iron pipe, with the aid of insulating joints, as shown in Fig. 1, in which *A* represents the cable sheath. This insulating joint is not made at a splice in the cable, but a piece of sheath, *B*, about ¼ or ½ inch in width, is removed all the way around the cable. This cut is not made, however, until the cable is soaked with paraffin at that point. This is done by cutting small holes about 4 inches each side of the place where the cut is to be made, as shown at *X*, and into which melted paraffin is poured until the cable is thoroughly saturated with it. The cut proper is then thoroughly boiled out with paraffin and the opening completely filled by winding candle wicking, *C*, around the cable until the slot is more than full. The wicking is then boiled out with more paraffin and the holes *X* closed with solder.

The entire cable is then tightly wrapped, for 4 inches each side of the cut, with alternate layers of common friction tape and okonite tape, using four layers of each, and painting each layer with a good asphaltum paint, as shown at *D*. A lead sleeve, *E*, is then slipped over the cable and the ends dressed in to fit the tape tightly, so as to aid in excluding moisture in case the splice is exposed to dampness. The joints of the sleeve are then built up with tape, as shown at *F*, and given two coats of asphaltum paint. The part of the cable

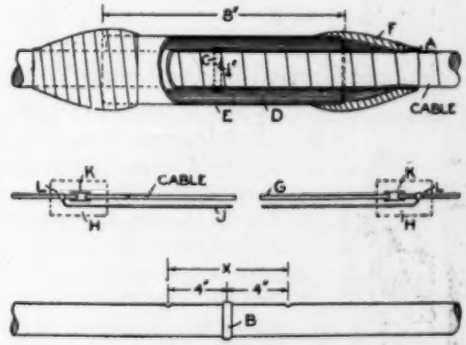


Fig. 1—Method of Insulating the Cable Sheath and Manner of Connecting the Bond Wire in the Manholes.

touching the bridge is shown at *G*, while *HH* are the manholes at each end in which the joint is made. The bonding wire, the size of which depends on the amount of current flowing into the cable, is shown at *J*. The position of the insulating joints in the manholes are shown at *KK*, and the point of connecting the bond wire with

the cable sheaths at *LL*. The ends of the bond wire should be securely soldered to the sheath. The object of these joints is to break the connection of the cable sheath and at the same time maintain a continuous circuit for the prevention of electrolytic action.

The proper method of bonding an aerial cable is shown in Fig. 2. This bond should be made every 1,000 feet, and a ground connection every 5,000 feet. The method of attaching the messenger to the cable is shown at *M*, where three bolt clamps are fastened to the messenger and also to a piece of messenger wire about 3 feet long. The far end of this short piece of messenger wire is then fanned out, placed around the cable and fastened with a small piece of copper wire. A solder joint is wiped over both the cable and the fanned-out wire, and a neat appearing as well as a mechanically

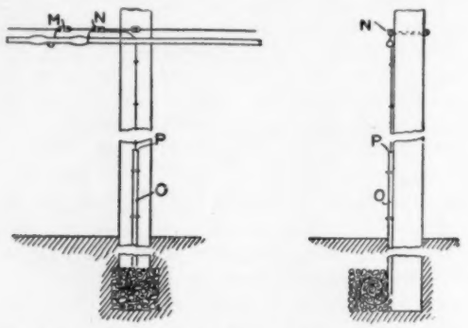
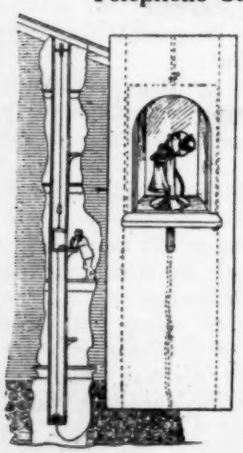


Fig. 2—An Aerial-Cable Bond to the Messenger and a Ground Connection at a Pole.

perfect job is the result. When the ground wire is run, the bond and ground connection are made as shown at *N*, and the wire must be continued from the clamp, down the pole, and into a ½-inch galvanized iron pipe, *O*, which extends about 3 feet above the ground. The wire should be a 6M guy wire and is fastened to the pole with galvanized staples, about 2 feet apart, and the pipe is held to the pole with clamps. Where the wires enter and leave the pipe, at *P*, the openings in the pipe must be closed with solder to exclude all dampness. A hole, about 18 inches square, is then dug at the base of the pole and 4 feet below the surface of the earth. The hole is filled with coke or charcoal and a 15-foot coil of ground wire placed in it.

Telephone Carried by the Dumb Waiter



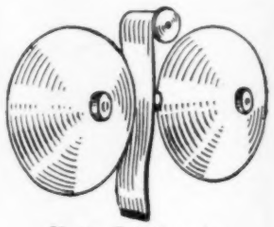
Telephone in Dumb-waiter.

THE manner in which a single telephone is made to take the place of extension telephones is here shown, says *Popular Electricity*. The instrument is installed upon the lift of the dumb-waiter and a sufficiently long and flexible connection is spliced into the telephone circuit. All that is then necessary in order to answer the telephone from any floor is to pull the rope of the dumb-waiter. This system was found to serve its purpose in one case at least, although its general adoption would probably not be relished by the operating telephone companies.

Recording Telephone Calls

DESIRING to know if there had been a call on the telephone in my absence I devised the arrangement shown in the illustration, to record the call, says a writer in *Popular Mechanics*. When I returned it was only necessary to call those from whom a call was expected.

The recording device consists of a strip of carbon paper cut together with a tissue-paper protection, about ½ inch wide, both being rolled on an ordinary pin, provided with a cardboard disk at the head and stuck into the wood of the bell box of the telephone. The pin should be placed so that the end of the paper can be pulled between one bell and the clapper, as shown, and it should be pushed in until the cardboard disk acts as a retarder on the paper.

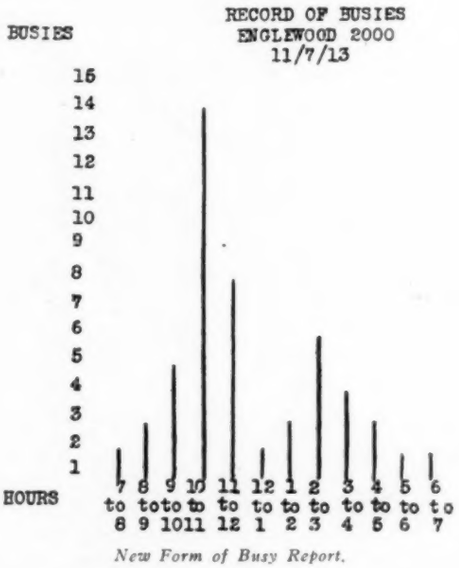


Simple Call Recorder.

When leaving the house, the end of the paper is drawn in position, and if a call has been made, the clapper records it on the end of the tissue paper. This end can be torn off and the strip placed on top of the bell, out of the way, until it is necessary to use it again. Any one of the various forms of paper clips fastened to the end of strip will hold it.

New Style Record of Busies

ONE of the most effectual means we have discovered to induce busy subscribers to take additional facilities, party line subscribers to regrade to direct, etc., is to submit a graphic record of busies for a certain period, worked out in days, or a selected day arranged in hours,



New Form of Busy Report.

or some other variation, to meet the special case being dealt with, says H. Bell in the *Telephone Review*.

It brings the case clearly before the subscriber, and the fact that we have taken the trouble to present it to him in this shape impresses him favorably. The time involved in preparation is inconsiderable and is well warranted by the results.

Patents in Relation to the Telephone Industry

Patent Capitalization versus Patent Dissipation in the History of the Art

BY GARRISON BABCOCK

THE telephone entered the field of industry with a patent controversy between Prof. Bell and Mr. Gray. That contest resulted in some changes in patent office filing methods. However, the Bell patent established monopoly, which from its inception to the present day has been capitalized in the three phases of patent monopoly: Manufacture, sales and use.

At each stage of advancement in the art a new name has entered prominence, due to the successful issue of a patent through the various stages and courts of patent interference, which usually attends an important invention.

The Bell Company has at all times kept a watchful eye for outside inventions, and curiously some of the greatest advancements to the art have been developed outside of the Bell laboratories—Edison's electric transmitter, Pupin line loading, Lundquist percentage automatic switching and literally hundreds of minor improvements. Because of the fact that the Bell stock issues, internal contracts, licenses, purchases and even income from subscribers and toll users is based, primarily, on one or more of the three patent values, the Bell company has zealously regarded its own and aggressively regarded other patent rights.

In the early days the Bell agents, under court orders, sought out "contraband" telephones and burned them in public places. Later, as their early patents expired and "upstarts" appeared on the market, patent suits and threats of all kinds of trouble were more or less successfully used against the independents, who surged into the field and in the course of a few years increased the number of telephones in use from a few hundred thousand to as many millions.

The one element of difference between Bell and independent interests lies in Bell patent capitalization and indpendent patent dissipation.

In the telephone beginning territorial "rights to use" was the rule by which the present Bell licenses were created, and rates were so high there was little necessity to capitalize manufacturing and sales patent rights. But when increases of capitalization became necessary, the outstanding manufacturing licenses were collected and the Western Electric Company was created the sole manufacturer and made a subsidiary of the parent company. Here enters the complete capitalization of patents—the Western Electric stock, which was principally owned by the A. T. & T. Company, was the channel through which manufacturing and sales patent profits returned.

The millions which this element of telephone patents has paid to the Bell company may be estimated by a calculation of Western Electric dividends. This profit, however, has been a pittance as compared with the patent license to use. Three dollars per telephone instrument, annually, counts up rapidly as the years roll by, and millions of telephones are installed; and when one dollar per switchboard line equipment, and more for "composite sets" and switchboard operators' sets is added, there has been an "Aladdin" in the industry for the Bell company, through its non-competitive field, which has embarrassed the competitive field and enabled ruinous rate war to be carried to the limit.

Today the license contract has been replaced largely by "general engineering" charges of 4½ per cent gross, and the recent annual report of the A. T. & T. Company to its stockholders, after supplying a composite financial statement of the Bell companies at large, is mainly devoted to an exposition of its development, cables, receivers and automatic switchboards, by its staff of five hundred and fifty engineers, representing seventy institutions of learning.

Over $50,000,000 worth of supplies from the Western Electric Company with manufacturing and sales patent profit, added to the 4½ per cent gross from subsidiaries, doubtless represents a sufficient sum to fill the author of the annual report with such sentiments as that expressed in one of the closing paragraphs:

> It can be said that this company has created the entire art of telephony and that almost without exception none of the important contributions to the art have been made by any government telephone administration, or by any other telephone company either in this country or abroad.

The supreme assurance behind that statement, which has been reprinted in hundreds of daily papers and periodicals throughout the world, will have its good effect on stock and local good will as desired, and in all probability no thought was given to those inventors outside of the 550-70 bulwarks, who have contributed to the art quite in contradiction of the Bell statement, and who will feel the imaginary "brass collar."

Independent telephony, while blazing the trail into the homes of the farmers and common people, has carried the great traffic load of business in all of the cities, except those few metropolitan centers where the Bell has been successful in shutting out competition, and in the face of rate cutting, free service and special privilege.

Inspired by new enthusiasm during the days of expansion, capital entered the field freely; manufacturers doing a large volume of business made close prices, with little regard to patent rights. Where real or imagined infringement of Bell patents occurred, suits were instituted and in each of these events, which were many, patent expense was incurred by the independent interests. This expense was not restricted to Bell origin, as independent manufacturers infringed and sued each other until the meaning of the word "patent" in the independent field held only two factors, expense and defense. The word "profit" in connection with patents was given no concerted and constructive being.

During the past seven years regulation has entered the industry in practically every state in the Union; capitalization is now restricted by valuation and rate making holds closely to this factor also.

The vital question, after satisfaction to the consumer, is, therefore, valuation.

Book values and real plant values are admittedly at variance, as neither one has a rule by which they are established other than by specific investigation.

Investigation of any of the Bell values will clearly show the items of "patents" and "engineering" have continued to grow along with the plant increase, while if any similar item should be found in an independent plant, it would be on the other side of the ledger and of questionable consideration for allowance in rate making or

capital increase. However, the instruments, switchboards and engineering of independent plants have just as large real value as such items in Bell plants.

Independent manufacturers have vaults filled with patents and engineering records which have created, protected and made it possible to supply the apparatus and plans for construction of these independent plants. Of course, rate wars have in the past obscured this element of the independent business—the fight for existence was too keen; but today, under regulation and fair conditions in competition, the quality of service is first and valuation second in the effort for success and profit.

Any company having an ever-increasing list of complaints and a subscribers' waiting list is, of course, confronted with a more imminent problem. Nevertheless, the valuation question is bound to enter the vitals of every operating company, and as there are legitimate revenues connected with the business of nearly every company—such as real estate investments, sales of supplies, etc.—which do not enter into the profits from service income, but do enter the net profit account, is it not reasonable that independent, as well as Bell, should capitalize "patent rights to use"?

The one monopoly authorized by our government is that reward to genius and capital represented in inventions, used in advancement of the public welfare.

Manufacturing and sales rights must be realized upon in the future and the "rights to use" carefully preserved to the territories occupied by operating companies. Quality is a feature which is always an element in the price established by the producer and appeals to the judgment of the purchaser. It may be safely left to individuals, but patent rights should be recognized by organization and concerted action.

The telephone is constantly undergoing improvements, and modern methods are bound to be controlled by patents which involve genius in efficiency of service rendered and economy of operation. The first should justify the inclusion of increased plant cost into the rate-making valuation, where improved equipment covered by patents is used, and the economy should be capitalized in that account in the ledger, which will increase dividends to investors through patent rights to use, without reduction of rates.

Here enters the element of interest in which manufacturer, operator and trade journal will find mutual advantage.

An investigation of the number and validity (uncontested) of patents involved in the equipment used by the independent companies would undoubtedly increase our respect for past and future profit and enable the establishment of reclaimed values.

It would seem reasonable that preceding such an investigation by associations of independent telephony, the manufacturers agree to issue to their customers an exclusive license, carrying into fact the assumed relation between supplies and purchaser, and that the future might be improved by full realization and appreciation of what other industries enjoy and our government promotes.

If the associations were enabled to make an annual report relating to the independent industry from the same standpoint as that taken by the Bell company in its recent report with the patent situation capitalized, there would doubtless result a much increased demand for independent telephone securities.

Lewis Institute, Chicago, last winter ran a special evening course in telephone engineering, in charge of Arthur Bessey Smith and Fred R. Quayle.

Formation of Michigan Association

The Michigan Telephone Association was organized in Lansing, Mich., March 25, following an all-day session of 200 representatives of Michigan telephone companies.

All telephone companies in the state, whether organized for profit or mutual benefit, are entitled to join. The purpose of the association is to bring together the telephone companies of the state for mutual benefit and to create a better understanding between the companies and the public. The suggestion of the association came from the state railroad commission and is similar to associations in several other states. Each company is entitled only to one vote on matters that may arise for consideration and adoption. An annual membership fee of $2 is included.

A committee of five was named to set up a standard of construction rules for telephone lines, in view of formulating some scheme to reduce party line subscribers. This committee will meet later with the railroad commission.

Chairman Hemans of the commission delivered an address at the opening of the session and advised that the telephone companies adopt a uniform system of collecting accounts. One half of the work of the railroad commission comes from the telephone companies of the state, according to Chairman Hemans.

N. F. Wing of Grass Lake, interested in an independent telephone system, and for several years at war with the commission, made an unsuccessful attempt to have the organization composed only of companies locally owned. His attack was aimed at the Bell interests. He was practically alone in his contention, however, as those present, composed in the main of small independent companies, thought the plan of the railroad commission a good one, and were anxious to carry out the co-operative plan. Chairman Hemans says the association should prove not only beneficial to the companies themselves, but to the public as well. It will also aid the commission materially in its work of administering the laws pertaining to telephone companies.

Florida Association Convenes at Ocala

The annual convention of the Florida Telephone Association convened in Ocala, March 26, and continued for two days. The session throughout was both pleasant and profitable.

W. G. Borein of Tampa, president, and E. E. Voyle of Gainesville, secretary and treasurer, were re-elected for the ensuing year. Miami was chosen for the next meeting place.

After the business session held in the court house the delegates and the staff of the Ocala exchange enjoyed a banquet; in the morning the visitors were taken in automobiles to Silver Springs.

Among the delegates present were W. G. Borein of Tampa, A. B. Leonard of Lakeland, R. L. Maffey of Tampa, A. B. Jordan of Tampa, W. U. Laithrop of Bradentown, Dr. Watkins of Micanopy, H. C. Russell of Tampa, F. A. Radu of Chicago, E. E. Voyle of Gainesville, H. R. Frazier of St. Petersburg, E. T. Knight of Lake Butler, W. B. Merck of Eustis, W. A. Parr of Sanford, G. C. Fussell of Miami, Ed Scott of Arcadia, F. B. Vary of Jacksonville, E. S. Moorer of Atlanta, J. R. Owen, W. T. Gary, J. P. Phillips and J. F. Redman of Ocala, James Garrett of Bradentown, R. L. Boyd of Jacksonville, David Laird of Savannah, W. H. Adkins of Atlanta, and J. F. Vaughn of Tampa.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

By FRED W. SCHOLZ

HAMBURG'S telephone exchange records the number of calls made by the various subscribers by using an automatic counting device, which has to be operated by the operator pushing a button. While this extra operation of pushing the indicator or counter button does not take very much time, it takes, nevertheless, too much time during the rush hours, and efforts have therefore been made to reduce the counting system to a purely automatic one, in which the operator need not take part at all. In order to make the difference between the two systems plain, a description of both the old and the new has been given.

Fig. 1 shows the wiring diagram for the old style system. As soon as the subscriber removes his receiver, the feed relay in the A-exchange receives current. Current passes through the attracted armature *1* and the armature *TRa* and makes the lamp in the A-exchange flicker. The A-operator now plugs the plug *ASa* of an open line (recognized by the open wire lamp of the lines, lamp *Fla*) into the jack *Ka*, belonging to the proper lamp. *TRa* now receives current, its armature is attracted and interrupts the flicker current. *Ala* becomes dark, the plug *ASa* in jack *Ka* connects the *a*- and *b*-wires of the subscriber line with *a*- and *b*- of the trunk distributing line and thus lengthens the line to the *C*-exchange, where the distributing wire ends in multiple system in the jacks *Kc*. Since in the *A*-exchange the armature *2* is attracted by *ARa*, a connection is made over this very armature between the one wire to the call counter *EZa* and the *C*-wire of the distributing line. The second current connection from the exciter coil of *EZa* is made over the springs *1* and *2* of *Ka* with the (—) pole. The *c*-wire of the distributing line is only connected with the *C*-exchange when *TRb* has answered. This takes place as soon as in the *C*-exchange the calling plug *ASc* has been placed into the jack *Kc* of the distributing line, and when *TRb* receives current over *SRc*. The operator does not receive any direct automatic signal from the subscriber telephone, i. e., the C-operator. The B-operator at the trunk line informs her to what distributing line in the *A*-exchange the subscriber has been connected. In this way the C-operator is enabled to ask the subscriber for the required number. While she places the plug *ASc* into the jack *Kc* in order to receive the number, both the a- and b- branches of the subscriber line are connected to the receiver of the C-operator by way of *Ka, ASa*, distributing line *Kc, ASc*, armature *4* and *5* of *HRc*, speaking key *Hc* and over armature *1* and *2* of *TRc*. Since *TRb* has replied, the following parallel circuits are constructed: 1. Earth, *TRb*, armature *1* of *TRb, ASa, Ka*, armature *2* of *ARa*, exciter winding of *EZa*, springs *2* and *1* of *Ka*, and the (—) pole. 2. Earth, *TRb, Kc, ASc, SRc*, and the (—) pole. The latter circuit receives in front of the *SRc*-relay still another branch over the springs *1* and *2* of the counter key *ZTc* and further over the 5,000-ohm winding of *Rc* to earth. As soon as the counter button *ZTc* is pressed, current is sent over the 5,000-ohm winding of *Rc* from *Rc* over *SRc*, and *EZa*. *Rc* calls and places its second coil and the relay *ZRc* parallel to the 5,000-ohm winding (over its closed armature), while *ZRc* owing to its strong spring tension does not operate as yet.

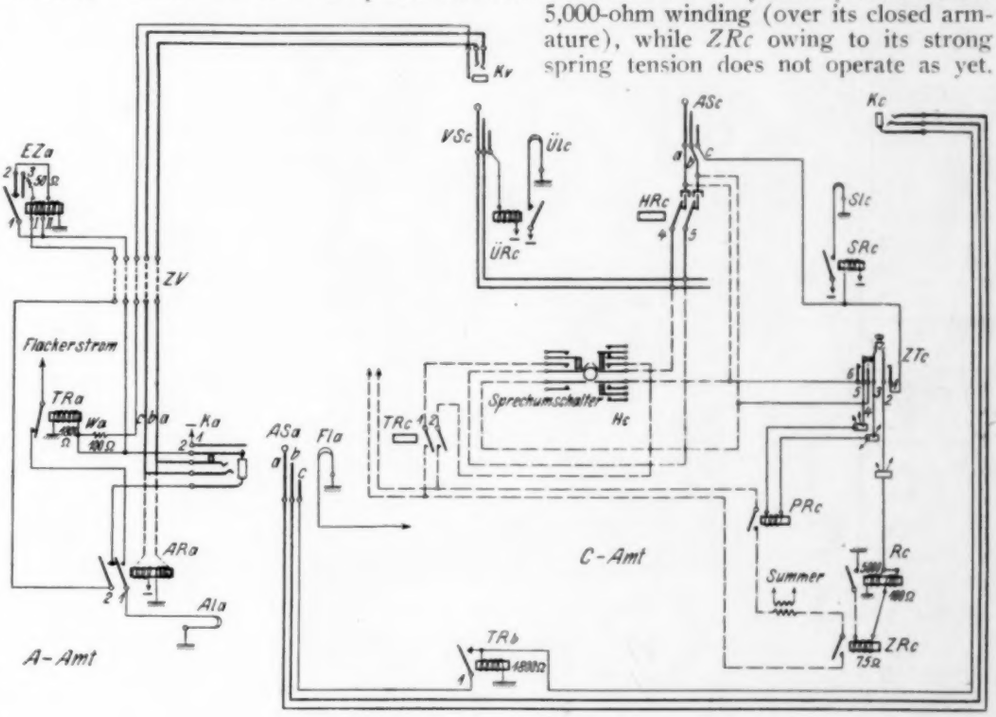


Fig. 1. Old Style Call Counting System.

The winding *I* of the counter *EZa* receives so much current that its springs *1* and *2* close and thus bring current to the winding *11*. Under the action of both windings the counter operates its counting device, and closes springs *2* and *3*, so that all three springs touch, and the winding *I* is short circuited. Through this short circuit the current increases so much that *ZRc* operates. The springs *3, 4, 5* and *6* of the counter key *ZTc* are to connect the relay *PRc* in bridge to the a- and b-branches of the distributing line, and therefore connect it with the feed relay *ARa* of the subscriber line, so that during the counting operation, *ARa* is excited and the connection with the counter apparatus is made by way of its armature *2*. The two relays *Rc* and *ZRc* are to connect a buzzer circuit which connects to the receiver of the C-operator. The operator

hears a buzzing and knows that the recorder works when she presses down the proper key. Moreover, she receives a visible signal, for, as soon as the exciter winding is short circuited (*EZa*), so much current is taken from relay *SRc*, that its armature falls away and lamp *Slc* goes out.

In order to relieve the operator of the care of pressing the counter key, and thus give her one operation less and more time to attend to calls, it will be necessary to transfer this work to new relays. The new automatic recording device that has been introduced in part in the Hamburg exchange, is shown in Fig. 2.

Registering of the call is here to take place as soon as the speaking key *Hc* has been changed from the answering position to the calling position, in the Fig. moved down from above. The call is then to be registered before the subscribers have started to talk, but after the connection has been completed. The speaking key *Hc* is provided with a steel pin *s*, which at its free end is bent in the shape of a right angle, and is provided with some insulating material. The contact row of this same key is

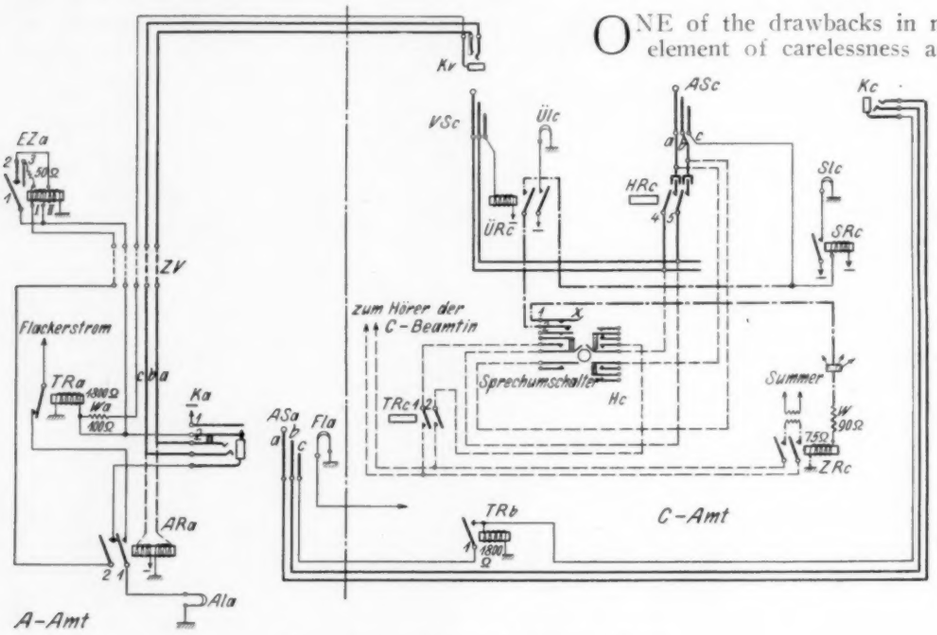


Fig. 2. New Automatic Call Counting Device.

increased by two more springs *1* and *2*. If the speaking key *Hc* is in the answering position, the little insulating roll of the pin *s* on the left surface moves in the direction from below to above, without closing springs *1* and *2*. The spring *1* is somewhat bent, so that the contact process is retarded, and to prevent insufficient contact during the return of the calling key into the calling position. If now the current branch running from *SRc* is not allowed to pass over springs *1* and *2* of the present counter key *ZTc*, but rather over the two new springs *1* and *2* of the speaking key *Hc*, the counting manual key is unnecessary and counting is done automatically. As the call is counted before the beginning of conversation while the first subscriber has his receiver in his hand and *ARa* is within the current circuit, when there is in any case a connection to the counter *EZa*, it is not necessary to have a special bridge to the *ARa* relay of the subscriber line. Consequently springs *3, 4, 5, 6* are not needed and the old *PRc*-relay at all C-operators' boards is unnecessary. The same is true of the *Rc*-relay. On the other hand the *ZRc*-relay is given a 90 ohm resistance. *ZRc* receives two working contacts, instead of one, over which the buzzer current reaches the operator receiver. In order to avoid working of the counter when the connection is not made, the branch running to the *ZRc*-relay is passed by way of a second contact, aside from the springs *1* and *2* of the key *Hc*. This contact allows the register to act only when the calling key has been changed from the answering in to the calling position, and when at the same time plug *VSc* is in the *Kv* jack, and therefore *URc* has worked and its armature *2* is closed. When the counting device works, *ZRc* operates and the buzzer circuit is closed for a short time. In the new automatic counter device, the system of working is therefore not at all changed, only the time at which the register is made is transferred and the manual counter key which is pushed down by the operator, involving a second special operation, is eliminated.—*Telegraphen und Fernsprech Technik.*

IMPROVED MANUAL TELEPHONE OPERATION.

ONE of the drawbacks in manual telephone operation is the element of carelessness and weakness on the part of the operator, which can only be reduced by very careful and strict supervision. Among these faults there is the carelessness which allows the lines of two subscribers who have finished their conversation to remain connected, thus making both of them useless for new calls.

The following device is to obviate this difficulty by making the action of the cut-off relay depend on the clearing relay of the calling cord, so that with insertion of the answering plug, the cut-off relay is energized by the clearing relay of the former, and the calling relay is cut off, as well as current sent through the testing line. As soon as the calling subscriber hangs up his receiver and thus makes his clearing relay currentless, the cut-off relay is also made currentless, the busy signal is released, and the calling signal is set up immediately, showing the line to be ready for a call.

Fig. 3 shows the wiring diagram of this device, for an A-operator. The cut-off relay *D* lies in the current circuit of the clearing relay *ST*, which is connected directly to the subscriber's branch in the answering cord. The wiring of the clearing relay is the usual one, except that the cut-off relay is in place of the clearing signal lamp. All lines from the answering plug end at the cut-off relay *D* in open contacts. The relay *D* has double winding, one of them lying in the local circuit of relay S_1, the other in a circuit dependent on two springs in the listening key. On relay *DD* normally all contacts of the lines to the connecting plug *CP* are open. Relay *DD* is controlled by the clearing relay *S* in the connecting cord. In the figure, *S* shows a contact, which temporarily closes a circuit to the automatic counting device and then opens it again. Relay *DD* has double winding, one lying in the local circuit of relay *S*, the other being locked in

D by special springs in such a way, that relay *DD* is controlled by *D*. Only when relay *D* makes it possible, can the relay *DD* be influenced for disconnecting by the calling telephone. In order to prevent the calling subscriber from holding the relay *DD* when the telephone is not in use any more, the winding depending on relay *S* forms a shunt with the signal lamp *L*. When, therefore, relay *S* through removing the receiver in the called subscriber office, is made currentless, it opens the shunt to *L*, the latter glows, and informs the operator of some trouble in his telephone. As long as current flows through *DD*, it closes a circuit over Lamp L_2. The action of the device is as follows:

As soon as the operator places her inquiry plug *AP* into the jack of the calling subscriber and uses her listening key *K*, relay *D* is excited, since a current circuit is closed from earth to key *K*, the respective springs and the coil *b* of the relay *D* to battery. All connections to the calling line are made and relay S_1 is excited. The latter closes a current circuit over the *a*-winding of relay *D*, so that the latter remains excited even when key *K* returns to the rest position and the *b*-branch is again opened. Current through r_2 gives the needed energy for testing. The excited relay *D* moreover closes a circuit from earth to the lower winding of *DD* to the battery, so that *DD* is also excited, and lamp L_2 lights. The operator tests the desired line in the usual manner, places the connecting plug *CP* into the proper jack and calls. Lamp *L* will then glow, until the called subscriber answers. As soon as this is done, relay *S* is excited, forming the shunt to lamp *L* and the latter goes out. Relay *S* also closes the holding coil of relay *DD*. The connection is now made. When the calling subscriber hangs up his receiver again, relay *S1* is currentless and opens the current circuit of the cut-off relay *D*. The latter opens all of the connections to the connecting plug *CP* and the current circuit of the exciting coil of *DD*. The line of the calling subscriber shows immediately that it is open, calling relay and calling lamp are again connected with the subscriber line and a second call can be made. Lamp *L2* ceases to glow and the operator knows that the plugs are ready for further use. If the called subscriber is the first to hang up, relay *S* becomes currentless, opens the upper or shunt winding of relay *DD*, so that lamp *L* lights. Relay *DD*, however, remains excited through the contact at *D*. If the lamp remains glowing any length of time, the operator will make inquiry at the subscriber station in question. As the plugs in this new diagram, are electrically negative and without effect, it is clear that it is not necessary to remove them. They can even remain in the jacks until they are needed elsewhere. For the same reason the glowing, a negative signal that conversation is closed, is no disadvantage, as the connection has been broken automatically. Moreover this glowing can be used by the supervisors to see how far and heavy traffic is at any operator's switchboard.—*Zeitschrift für Schwachstromtechnik.*

SAFETY WIRING FOR WET ROOMS.

WHERE telephone plants are in smaller cities, in which the conditions are not always ideal, it is very essential that the wiring be placed so that there is no danger to those who are working in the plant or those who have to inspect the cables and lines. A large German electrical plant having a good deal of trouble with electrical connections in moist places, especially in cellars, has introduced a safety wiring arrangement, which is shown in Fig. 4.

Outside of the use of acid- and moisture-proof insulation around the conductors, and the use of large porcelain insulators, it is advisable to connect metal pillars, or any metal parts in the wet room with each other by means of 4 sq. mm. copper wire, and then to ground them through the special safety circuit. The safety device has a magnetic coil which is placed between the iron parts to be protected and earth. This magnetic coil is excited, when through some circuit in the plant the metallic construction parts become conductors. Through the excitation of the magnet spool an armature is attracted, which operates or releases the safety device. When this is done the entire faulty circuit is cut out and at the same time short circuited. The safety fuse which is burned out at this time can only be replaced after the fault has been located and rectified. The wiring leading from the metal constructions to the safety device must be insulated from the walls of the building, using insulated wires in the wet room and the ordinary bare copper wire in dry rooms. The same is true for the connection between safety device and earth; the permanent earth resistance need not be more than 20 ohms. The safety switch may also be mounted on the switchboard found in all plants where current must be distributed for various uses. Following is the translation of the readings in Fig. 4:

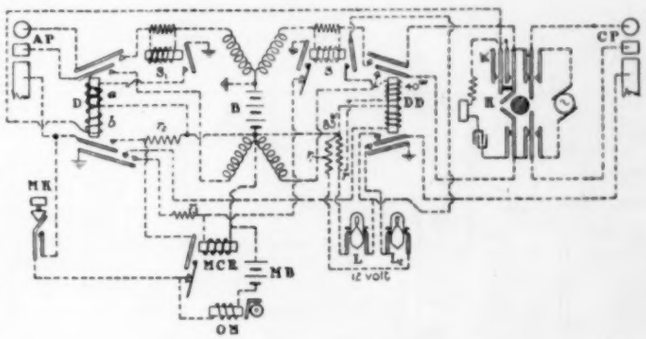


Fig. 3. Improved Cut-Off Device.

Eisenkonstruktion = iron construction; *Magnetspule* = magnetic coil; *Erde* = earth; *Schutzschalter* = safety switch; *Phasenleiter* = phase current wires; *Nulleiter* = neutral wire; *Verteilungssicherung* = distributing fuse. —*Elektrotech. Zeitschrift.*

THE LIEBEN TELEPHONE RELAY.

THE following article, taken from the *Zeitschrift für Schwachstromtechnik*, was called forth by the recent death of Robert von Lieben in Vienna, who among other scientific problems worked on an effective telephone relay. In 1904 Lieben was working on the problem of electric discharges in partial vacuums. The peculiar cathode rays coming from the negative pole also give the basis for the explanation of the theory of electrons.

If a glass vessel closed on all sides is changed into a vacuum, or a condition approaching a perfect vacuum, and if through this vessel an electric current is sent, we obtain first the well known sparks of the Geissler tube, and then light phenomena of an entirely different kind. Finally we have the so-called cathode rays, which are plainly visible from the negative pole and which are capable of magnetic control. According to the theory of electrons they represent metallic particles of the cathode, torn away under the influene of the electric current, and of minute size. These electrons, coming into the vacuum in their flight to the anode, smash the gas molecules, as soon as they have reached sufficient speed, thereby bring-

ing the gas molecules that have been split into positive and negative ions to emit light. In general such cathode rays could only be obtained in the past when a high electric voltage of several thousand volts was at hand. In 1903, however, Professor Wehnelt made the discovery that cathode rays could be obtained at much lower voltages, if the negative pole, the cathode, were covered with a coating of unslaked lime, and then heated to red heat. When von Lieben saw this discovery, he conceived the idea to use this same principle for his telephone relay. He argued in this way: If cathode rays are possible at 100 to 200 volts, then there is also the possibility, to call forth pure direct current impulses. It is not necessary to employ the complicated apparatus for alternating current, inductors, etc., but the ordinary direct current used for lighting can be used for the production of these rays. The advantage of using this direct current eliminates all the disagreeable noises that are usually called forth by alternating currents in telephone instruments. Taking account of these and other principles, Lieben constructed his cathode ray relay, in which the pencil of rays, coming from a Wehnelt cathode of concave shape, was changed slightly in its direction by the telephone currents to be increased, by means of electromagnets. The point of this pencil of rays struck two

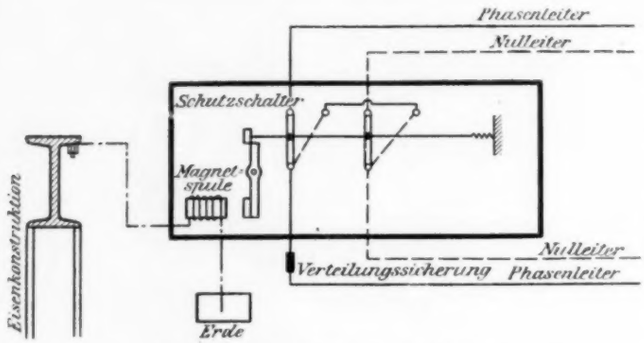


Fig. 4. Safety Wiring for Wet Rooms.

metal cylinders, fastened together in concentric shape, insulated from each other, the outer cylinder being provided with a slot. Both cylinders were used as anode, and the receiving instrument was connected to the current passage of the inner cylinder. The cathode rays were changed in their direction to a larger or smaller degree and the inner cylinder was struck more or less by the conical point of the pencil of rays, so that the receiving instrument had to reproduce the sounds, reinforced to a considerable degree. The strength of the current passing through the discharge tube depended in the first place on the temperature of the red hot cathode. This current, however, was stronger than the original telephone current. The strengthened current would therefore be better audible in the telephone, although it still retained the same pitch and modulation. The principle of a gas discharge relay was therefore solved, at least theoretically.

The word "relay" represents in general a means for harmonious reinforcement of primary effects. Its use in telegraphy is well known. If, however, the equivalent strengthening of sounds or of music is to be accomplished, we need a more complex apparatus than a mere relay, which can close and interrupt a circuit. We need rather a device which will increase and reproduce faithfully even the most delicate and finest shade in change of tones. A purely mechanical system, with even the most delicately built armature would not give the desired effect. Every armature, no matter how fine, is a body covered with matter, which exhibits a certain inertia, i. e., the tendency to retain the position already obtained, and to give up this position only with a certain amount of forced opposition, when an outside force tends to move it from this original position. The cathode rays, are of course nothing but very finely divided particles of matter, which have a certain inertia. This is, however, of such minuteness that it is practically negligible. It is therefore clear that a relay whose principal part is such a pencil of cathode rays, practically devoid of inertia, must be as free from error as is possible in the physical realm, and must therefore work proportional with all primary effects. Even though the inertia matter was disposed of, there was still another point in the rather slow action of the magnetic properties of the iron in the coils. Lieben worked on this problem for years and finally solved it to his own satisfaction. Instead of using electromagnetic influence on the cathode rays, he used purely electric effects. The latest development, which has been patented and used by the Siemens-Halske and the Felten-Guillaume companies, will be briefly described.

A glass vessel about 30 cm. long has at its lower, tubular end a metal rim, with four contact terminals to set into the corresponding hard rubber casing. Immediately above this metal rim is a bulblike expansion of the glass vessel, similar to those in the modern tungsten lamps, and above this is a cylindrical glass portion. In the bulb part a zigzag shaped narrow platinum band has been fastened, using a band rather than a wire to obtain greater surface with the same cross section. On the platinum band outer surface the calcium oxide layer is deposited in accordance with a special process invented by Lieben. Where the bulb shaped glass changes into the cylindrical form, we find a narrow necklike section which is filled by a platinum disc, thus practically dividing this into two sections. This disc is perforated by several hundred small round holes (about 3.5 mm). This is called the auxiliary or third electrode. A glass supporting rod is passed through the center of this disc, and carries at the upper end a heavy spiral-shaped aluminum wire, the anode. All current paths are therefore on the inside of the glass discharge tube and lead to the contact terminal pins in the rubber cushion, two pins being used to heat the platinum band, the two others leading to the auxiliary electrode and anode. The platinum band is heated to about 1,000 degrees C., that is, red heat. It may be mentioned as a matter of comparison, that the ordinary metal filament electric lamps heat their wires to 2,300 degrees C. Instead of passing the telephone current over the deflecting magnets, it is here passed over an induction coil, building this for a certain direct current tension. This makes it also possible to control the sensitiveness of the relay. The cathode band is connected to the usual 30 volt tension in telephone exchanges. The voltage connected to the auxiliary electrode is only a few volts less than this, while the voltage between the extreme negative end of the cathode and the anode has almost a universal voltage of 220 volts. In consideration of the extreme sensitiveness of the auxiliary electrode, the latter and the heating tension must be supplied by storage batteries, while the 220 volts can be taken from any lighting wires. The sieve-shaped electrical auxiliary electrode increase the resistance in the discharge tube, increasing with the decreasing magnitude of the direct current voltage. Inversely the apparent resistance of the entire tube decreases, when the voltage of the third electrode is increased. The tension of the auxiliary electrode is regulated and determined in such a way, that the

entire system is most sensitive to the smallest possible changes in tension, so that simultaneously the changes in current strength must have the greatest value in the total discharge tube. Up to the present time, the telephone instrument was considered the most sensitive apparatus. The Lieben relay is, however, so sensitive that it reproduces and increases sounds that are entirely inaudible in the telephone receiver.

A further very important improvement must be mentioned in speaking of this relay. It consists in a short tubular projection at the lower bulbular section of the Lieben glass vessel, in which is found a small piece of amalgam. There is a reason for this amalgam. At a time when the entire relay was nearing a state of complete satisfaction, it was suddenly noticed that this tube when still in communication with the mercury pump worked satisfactorily, that, however, when disconnected from it, it ceased to work after several hours. Hundreds of experiments were made to eliminate this trouble, all sorts of hypotheses were set up and again discarded. Finally it was noticed, after eliminating all other possibilities, that it was the presence of mercury vapor at the very low pressure in the air (0.001 mm. mercury column) in connection with the minute traces of air left in the tube which was necessary to keep the relay working with the same sensitive force for several thousand hours. Then a small amount of mercury was placed in the tube and left there, and later this was changed to amalgam, and the problem was solved.

The most important use for the relay is, of course, in long distance telephone work. Long lines have the disadvantage that, owing to their electrical properties, chiefly the resistance, they use up the little energy of telephone currents, thus decreasing the clearness of sound transmission with every mile of distance. To increase the distance of telephoning without sacrificing clearness has always been the aim of telephone engineers. Moreover the relations between telephone transmission and distance are in very complex logarithmic ratios, which need not be mentioned here, except to say that for a given 1,000 km. distance, the telephone current primary microphone strength given, the 30-fold strength is needed to obtain the same loudness for double the distance of 2,000 km. The remedy has been found by placing a new relay every 1,000 km. and there is no reason why theoretically at least it would not be possible to telephone from Berlin to Peking by using a relay every 1,000 km. distance. The telephone exchanges, of course, demand that the relays shall have no influence on the clearness of enunciation of sound, and American telephone engineers have solved this problem to satisfaction. European telephone departments are now approaching this goal with the aid of the new Lieben relay. In long telephone cables the difficulties are especially great because the cables absorb a great quantity of energy through their condenser effect. For that reason cables either on land or sea can only telephone a distance of 80 km. A fourfold improvement can be obtained by using Pupin coils. Krarup obtained the same relative effect by winding iron wire around the copper conductor in the cable. Both are expensive, however, and the German Department of Posts and Telegraphy has made tests to see if the Lieben relay will not give the same service at cheaper costs. The results have been satisfactory and have been improved by using the so-called cascade system, in which several relays are used at the same time in the same exchange, in such a manner that one relay is reinforced by a second one and that one by a third one, if necessary, etc. If we hold to the principle that a relay multiplied 30 times, gives a 900-fold reinforcement, and the third one a 27,000-fold reinforcement, it stands to reason that the effects, at least as found in the laboratory, promise much for the future.

The most expensive part of the telephone management is the transmission wire, which is usually 4½ mm. With the help of the telephone relay it is hoped that this cross section can be reduced to 2 mm. This means an enormous saving in long distance systems. Even in interurban systems the effects can be improved by using the Lieben relay and thus making these shorter distances possible for telephone use, whereas that would be impossible without the relay. Another field is the wireless telegraph and wireless telephone. The German navy has introduced the Lieben relay in nearly all its warships for wireless telephone work to reinforce the sound. The high tension tube offers the possibility of production of undamped oscillations of electric waves, whereas up to the present this effect has been obtained with the use of very complex apparatus. It has even been hoped that it might be possible to connect Europe and America by means of wireless telephony with the use of these relays. There seems to be no end to the use of the high tension Lieben relay for work where there are a lot of secondary noises, and it is hoped that other men will carry on the work of Lieben, who was unfortunately removed from his field of activity by an untimely death.

Seeks Privacy on the Telephone

Aroused by the fact that when a man uses a telephone unauthorized persons may overhear all he has to say, George Stewart Smith, 18 Broadway, New York, is circulating petitions to the New York Public Service Commission of the second district, asking it to investigate the possibility of obtaining a device which will insure telephone privacy.

Mr. Smith explained that he believed that there were in existence two or three devices which would attain his object, but he declined to give the names of their inventors on the ground that he had no desire to be supposed to be the promoter of any particular apparatus. He desired only to bring about, he said, a reform in telephone practice, and by what method it was accomplished was immaterial to him.

In the first place, Mr. Smith addressed the commission, informing it that he had accumulated in the last few years information which seemed to show that it was possible to "loop" a telephone line, and so listen to a private conversation. He suggested that there was need of legislation to place a penalty on such a violation of private rights.

It is not necessarily a fact that the managing officers of the telephone companies connive in these things, he said, but there are reasons for thinking that the more humble class of employes can be used, for the particular reason that their modest pay makes a small extra perquisite a great temptation.

At the offices of the commission it was said that many of these petitions had been received. It was explained it was not the function of the commission to take such a matter up of its own initiative, but if there was a sufficient public demand evinced the commission should undoubtedly cause an investigation to be made. This would result probably in public hearings, at which the telephone companies could express their views, and if a good case was made out an order might be issued calling on the companies to adopt some method of obtaining privacy.

Rapid Telephotography

Recently Prof. A. Korn, whose work in connection with telephotography, or the transmission of photographs by telegraph, is so well known, says Dr. Robert Grimshaw, and who has solved practically the transmission of illustrations and handwriting over long distances by wire, read a paper in Vienna on improvements made and probable in the line of rapid transmission over long distances; with special reference to the transmission of kinematographic film pictures. The most important problem to solve is increasing the rapidity of transmission. This is limited on the one hand by the inertia of the apparatus used to receive and to transmit; but much more by the capacity of the circuit to transmit the signals or impulses which together make up the picture received.

For sendings through short lines, the speed which has hitherto been attained, about fifteen minutes for a picture 13 by 18 centimeters (5.12 by 7.09 inches) can be considerably increased, as the sending and receiving apparatus permit this; but the main advantage in phototelegraphy is the ability to beat the post, which comes into play only on long lines such as Berlin to Vienna, Berlin to Paris, etc. This would permit illustrated papers to print in their morning editions pictures which would not have reached them in time by mail. For this reason there would be no use in trying to increase the rapidity of operation of the sending and receiving apparatus, without having first increased the capacity of the line. This is a marked hindrance to the sending of kinematographic pictures, where it is necessary to send a great number of pictures one after another by telegraph in order that they may be assembled at the receiving end in film form.

Working with Herr Bruno Glatzel, Prof. Korn has made the first attempts at transmitting a kinematographic series of pictures; and as a result it appears that where there is an hour at disposal for the transmission of a series of 20 pictures, this can be done.

As the time required for the transmission of a picture 13 by 18 centimeters is 15 minutes, it is evident that where much greater speed is required, one cannot expect too much detail—so Prof. Korn has contented himself with a comparatively simple subject—the gestures of an actor. Four of the pictures immediately following each other were brought together on one plate, and this was sent in 12 minutes.

The pictures received are then arranged in the proper order of sequence, and transferred to a kinematographic film, which enables their being thrown upon a screen as a kinematographic picture.

This permits giving an occurrence which takes place at midday in Paris, in a Berlin "movie" on the next morning; and when the matter is of importance, so that the entire night can be devoted to its transmission, a good kinematographic representation may be given the next morning. These experiments also throw light upon the question of whether or not the problem of television or seeing by telegraph can be solved in the near future. A series of twenty kino pictures takes about 20 minutes of actual occurrence, but for the transmission, at least an hour is necessary. To send as fast as the actual occurrence takes place would require 1,200 times the present speed of transmission. For this reason, Prof. Korn gives it as his opinion that telegraphic vision can in the present stage of the art be accomplished only by the use of a great number of electric circuits. The principal hindrance to the accomplishment of this desired end is the enormous amount of capital which would be required.

Austria Has New Telephone Service

A new telephone cable has lately been completed between Vienna and Dalmatia, Austria; the line includes not only a land section, but also several submarine sections, linking up a number of islands in the Adriatic Sea. Ordinary bronze wire is used for the landline, and continuously-loaded cable for the underwater portion of the system. Tests recently made between Vienna and Sarajevo, a distance of about 875 miles, were completely successful.

The government is reported to be preparing a vast telephone programme, which will take four to five years to realize, and involve an expenditure of £3,750,000. In order to avoid raising a public loan, the government will invite the Austrian contractors—cable and telephone instrument companies, copper works, etc.—to finance the scheme by loans, which the latter will contract with local banks on the security of annual government repayments, spread over a period of 20 to 25 years.

Telephonic communication has been opened up between Vienna and Bucharest. The fee for a three-minute conversation is 6.50 kronen.

Telephone Postal Card

At a recent convention of supervisory postoffice employes at Toledo, Ohio, the subject of a telephone postal card was considered.

Mr. P. Kerr Higgins, general manager of the Texas Independent Telephone System, Waco, Tex., on April 28 of this year, presented the matter to Postmaster General A. S. Burleson, who thanked Mr. Higgins for the suggestion.

In his letter Mr. Higgins wrote:

> I wish to suggest the introduction of what might be known as a telephone postal card. The intention is that this card would bear a special stamp, say five cents, and it would be sent to destination in preference to all other mail matter. It would show not only the address, but also the telephone number of the one to whom it was sent. Upon its arrival at destination a clerk would immediately call up the telephone number, ask for the person the card was addressed to and read the message. If the person was not in, word would be left, as is done in the case of a long-distance message, e. g., "Have Mrs. Doe call postoffice for message to her."
>
> A reply postal card would be ten cents. The number of words could be limited and no liability assumed other than is now assumed on a special delivery letter."

Australia's Lack of Telegraph Mechanics

It is announced by the Australian prime minister at Melbourne that "the Postal Department is experiencing difficulty in securing a sufficient number of postal mechanics in Australia to satisfy its needs. We shall have to import them if we cannot get them in Australia. We don't want to do so, but the work of the department cannot be held up. If we have to go outside Australia we will try Great Britain, but I hesitate to think that there are not young men in Australia able to do the work that is required of them."

The public service commissioner has suggested to the prime minister that ten postal mechanics be imported from over sea. He requires that number for Western Australia, and says he has found it impossible to get them in that state, or in any of the other states. Postal mechanics are required for telephone and telegraph work.

Telephonic communication has just been established between the towns of Amparo and San Carlos, in the district of Ricaurte, Venezuela.

The Lay of a Layman

Just a Few Plain Thoughts on Some of the Aspects of the Telephone Business

BY THE T. E. DOPESTER

IT were ever thus. Should I fall heir to a piece of news, or no news at all, and attempt to set it forth by any of the known methods, right away I put my foot in it. Once upon a time I told the plain, unvarnished story of myself, and R. E. Macduff has never recovered from the shock of it! Last month I stumbled across a story which purported something of Charlie North's early activities in the telephone business, and right away I am charged with "attacking his personality." The record stands. Thank goodness, Mr. North himself has been more considerate. He says it is true that at one time the Standard Oil Company contemplated going into the telephone business, and that he did a lot of work for the concern in 1890 and 1891. This contemplated the developing and constructing of apparatus, including approximately two hundred telephones that were installed in different Standard Oil plants. A Standard Telephone and Telegraph Company was formed under the laws of Ohio and Mr. North was the manufacturer. This whole movement was inspired by the alleged abuses that were imposed by the Bell Telephone Company. But Mr. North doesn't agree with that part of my story which gave the Standard credit for financing the early North apparatus. He says the instrument he made for the Standard and the one he made for himself were not the same. And I'll take his word for it, because I haven't anything to refute the statement and have no desire to do so.

* * *

Through a second party I have learned that Mr. North built his first switchboard for an independent operating company in 1893, prior to Judge Carpenter's decision in the Berliner case. This switchboard was equipped with forty full metallic lines magneto and installed for Frank Hopkins at Garrettsville.

* * *

All of which goes to show that there are many things in the telephone business that have much of interest and are still waiting to be told.

* * *

Out in Nebraska the Bell seeks to issue $4,000,000 in two-year notes to retire an equal amount of floating indebtedness. A matter of this kind goes to the state commissioners of public utilities. The telephone company claims that the indebtedness is represented by improvements that have been made in the plant. It shows assets of $15,000,000, against which $6,000,000 of securities are outstanding.

* * *

All tabulations, estimates, declarations of finances and reports which emanate from operating telephone companies, whether monthly, quarterly, semi-annually or annually, always denote improvement, growth, solidity. If there is another business that can compare with this actual fact, let us hear from it.

* * *

The issuing of short-term notes seems to be proving advantageous to more than one industry, but the telephone operators are succeeding with the plan most admirably. The A. T. & T. Co. found little difficulty in marketing $30,000,000 of two-year 5 per cent notes of its various subsidiaries. These notes were ready sale at 99½ when endorsed by the A. T. & T. Co. When they mature, it is presumed that they will be redeemed with A. T. & T. Co. securities. It is another way to finance the subsidiary. The trial was made with $10,000,000 six months' notes last October, four subsidiaries participating in the distribution. The A. T. & T. Co. sells the notes that the subsidiary issues and these notes represent the advances received by the subsidiary from the parent Bell Company. They are handled by the same syndicate that has been underwriting the A. T. & T. Co.'s convertibles.

* * *

The Pittsburg & Allegheny Telephone Company is about to be relieved from the receivership that has been operating it since January 10, 1911. William Flinn and J. G. Splaine receive credit for the notable performance. Any telephone company in competent hands is the surest enterprise on the map.

* * *

Our old friend, H. D. Stroud, is fussing around at Des Moines. To a man up a tree, it would seem that Stroud has found some of Leroy Stanton's old letterheads.

* * *

Life ain't what it used to be since Kelsey's dropped from sight. I used to wait around to see the gore he spilled each night. For years and years he kept it up, and every week he'd tell what happened to that "ornery pup" that's fostered by the Bell. He—Kelsey—rampsed to beat the band and walloped left and right; no operator in the land who hasn't heard the fight. Jim Kelsey thrived upon the stuff; he heaved the bombs with vim. You always found him in a huff—a-quivering, tooth and limb. His vitriol pot was always full; his pen was steeped in blood; his good strong arm and steady pull was followed with a thud that made the boys sit up a bit, while others sought to duck, because someone was always hit, regardless of their luck. I miss the din of Kelsey's dope. There's nothing takes its place. The best for us is yet to hope that he'll resume his race.

* * *

We hear very little of the results due to the "Employes' Pension, Disability Benefit and Insurance Fund" created by Bell companies, effective January 1, 1913. In its annual report the Cumberland T. & T. Co. shows that $34,961.19 was required last year to satisfy two pensions; 238 disability benefits, due to accident; 171 sick benefits; 16 life insurance and 238 cases of disability expense. The total of Cumberland employes numbers 7,528 who are eligible to these benefits. The sum required to fulfill the company's responsibility under the operating plan of the fund seems to be very small. Cumberland Bell owns 200,014 stations and has interconnecting arrangements with 84,620 miscellaneous stations. There are 623 central offices and 709,226 miles of wire.

* * *

The Southern Bell T. & T. Co. required an outlay of only $27,033.62 under the same plan. This company has 5,342 employes on its payroll, 790 cases participating

in the company's plans of pensions, benefits and insurance. Southern Bell owns 163,888 stations and interconnects with 127,105 others. It has 279 central offices and 400,396 miles of wire.

* * *

The financing of a great telephone system—a public utility—will ever be one of those problems difficult of solution. The franchise is granted—the investment made on the theory of certain development—the rate for service fixed, usually by ordinance, and the game is on. But the best laid plans are often confronted with conditions that were not set down in the original draft. One can never tell about the growth of a city. They never know, even in a boom, which way, reckoned by the compass, the city will spread. Nothing at the outset contemplated the unusual. After a time the demands made upon the operator exceed his ability to supply service. Plant extension is expensive and more money is required. To secure added revenues, preferred stock or bonds may be issued; stockholders having first option to take them up. The Rochester Telephone Company has hit upon a plan to raise a needed $100,000 for plant extension. The company asks its bondholders to clip their interest coupons for two years in advance and exchange these for new general mortgage bonds at par. It denies the bondholder his interest for two years, but it will give him a larger company and proportionately larger dividends after the lapse of two years.

* * *

Some of the auxiliary suppliers of telephone accessories, having secured the contract for a certain large telephone manufacturer, are forgetting that the independent telephone investment of this country is roughly, though conservatively, placed at a round hundred million dollars. The business of the independent telephone operator has been somewhat quiet, since a meeting was held at the Blackstone Hotel, Chicago, a little while ago. At that meeting the subtle hint went out that the Boogyman would get you, eventually; that the Bell would buy what the independents had to offer. And the upshot of that hint was quieting, to say the least. However, there has been a change of late. The Bell isn't buying any more independent systems. Independent operators have suddenly been reminded that their properties require rejuvenating; that funds are required for that purpose. The independent telephone field becomes active over night and the new order should have a rallying influence in the sales departments of those concerns who seek orders. A property aggregating physical value of $100,000,000 is apt to need replacement supplies and what not. It is something to think about and when carefully analyzed there might be some significance in planting an advertisement in TELEPHONE ENGINEER.

* * *

In keeping with this suggestion, the A. T. & T. Co. announces a policy of rigid economy with the statement that it will do less in new construction for the next two years than has been the order heretofore. The Bell will sit tight until 1916—having concluded its financial operations until then. The independent field is open market. The sitting tight for independents is a closed incident. Beginning right now, independents start to hustle.

"Opportunity really knocks at many a door."

"Then why don't more of us succeed better?"

"The trouble is that opportunity wants us to go to work."—*Louisville Courier-Journal.*

How the Operator Found Yee Ling

Eight thousand miles from his home in China, Yee Sing was dying at the Homeopathic hospital in Boston. Before he died he wanted to talk with his lifelong friend who was born in the same city and came to the United States with him. And so, about 5 o'clock on the afternoon of February 2, a hospital attendant telephoned the information desk at the Oxford exchange and asked Miss Martha Bithell to find Yee Ling, address unknown.

It was an unusual case to handle, says *New England Telephone Topics.* The call for help did not come from a wealthy home or a great business house but from a lowly Chinese laundryman. But it appealed to the sympathies of Miss Bithell and she started to work at once. The task was perplexing and there was no clue. It was a job that required intelligence and painstaking effort. Without leaving her chair she must find Yee Ling—pick him out from the hundreds of Chinamen in Greater Boston, and give him an urgent message.

The story of the handling of that particular appeal for help from a hospital cot is one of the most striking examples of "service first." It emphasizes three points: first, the great resources of the company in times of emergency; second, the utter disregard of employes about the social standing and wealth of those who ask for help, and third, the intelligence and good work of the information operators.

A Chinese restaurant on Harrison avenue was the first place called. The Chinaman who answered treated Miss Bithell with stoical indifference. She tried to cajole him into giving her some information, but to no avail.

Then Miss Bithell called Oxford 22260, located in a Chinese store. She talked with a very intelligent Chinaman who did not know Yee Ling, but who gave her some addresses to try. And so the blind trail led to various places in Boston, Cambridge, Brookline and Brighton. There were talks with many Chinamen, with information operators in the different exchanges and with American storekeepers.

Nearly two hours after the hunt had started, the information operator in Brighton located a Chinaman, Tom Lee, for whom Yee Ling worked. After some persuasion Yee Ling was willing to step to the telephone and Miss Bithell talked *to* him, but not *with* him, for she could understand practically nothing and neither could Tom Lee.

But Miss Bithell was not discouraged. She was on the job to stay. Again she called her intelligence into play. The only Chinamen with whom she had previously talked who had seemed willing to assist was the one at Oxford 22260. Once more she told him of her predicament. He said he would act as interpreter. And so Oxford 22260 was connected with Brighton 516W in Tom Lee's laundry at 111 Brighton avenue, Brighton, and the message from the dying friend was told to Yee Ling in his native tongue.

Miss Bithell's work on this particluar case was done. A few seconds later she was busy helping to straighten out the troubles of scores of other people, rich and poor alike, for she keeps constantly in mind the slogan, "service first," and makes no distinction.

And Yee Sing died at the hospital a few days later without knowing what a great public service corporation, as represented by an intelligent information operator, had done to make his last hours happy.

Battery Ringing Telephones

Simple Systems Suitable for Amateurs or for Small Interior Installations

THERE is at the present time, and probably always will be, a considerable demand for the battery-ringing type of telephone instrument for short lines. These sets are much cheaper than the standard types, owing principally to the absence of the costly hand generator. They give very satisfactory service, are very applicable to code ringing, so that several sets may be bridged across one pair of lines, can be made very compact, and do not easily get out of order.

The disadvantage lies in their applicability to short lines only—say, up to two miles in length, or about 100 ohms resistance—owing to the large battery power required to ring the distant subscriber's bell when above this length of line is used. The transmission, or speaking efficiency, can be made good up to thirty miles or so very easily, it being only the ringing trouble which condemns the battery-ringing type of telephone instrument for long lines.

For domestic sets, office use, lines between signal stations, railway work, factory systems, etc., they act admirably as long as the number of stations do not exceed four or five, which are as many as can be practically handled by code ringing. When above this number are required, and not above twenty sets, battery-ringing telephones may be used in connection with an intercommunication system. The latter, however, lead on to more complicated systems which we will not here consider.

The simplest of instrument circuits, and one frequently adopted for domestic service between, say, the dining-room and the kitchen, is the "Converser" or "Metaphone" system, which will ring only in one direction, so that the maid cannot possibly ring up the dining room.

In the dining room a simple wall-fitting is used containing a switch-hook actuating a spring contact. A cheap form of hand set, consisting of a transmitter and receiver joined in series is adopted, and a suitable push-key provided for ringing purposes. In the kitchen the above are provided, except that a trembler bell and the battery are installed and the ringing key eliminated.

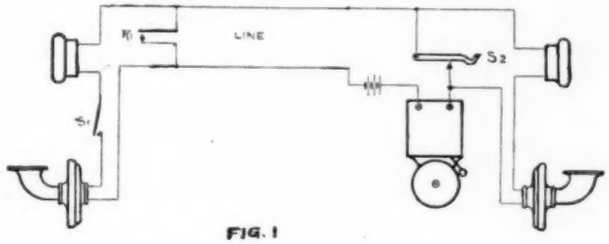


FIG. 1

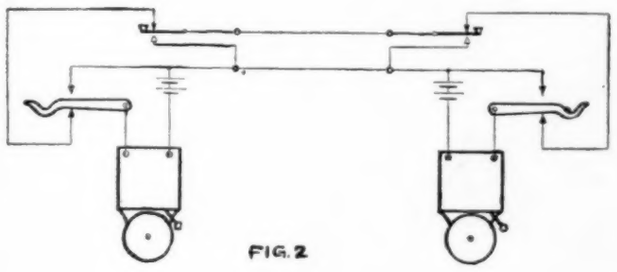


FIG. 2

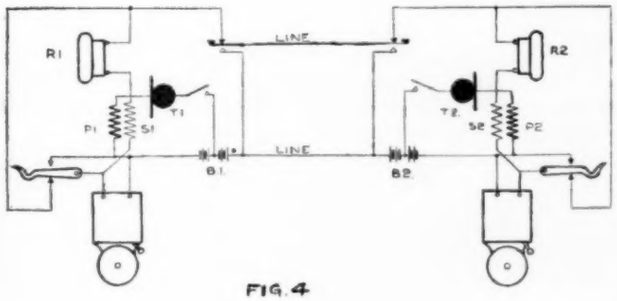


FIG. 4

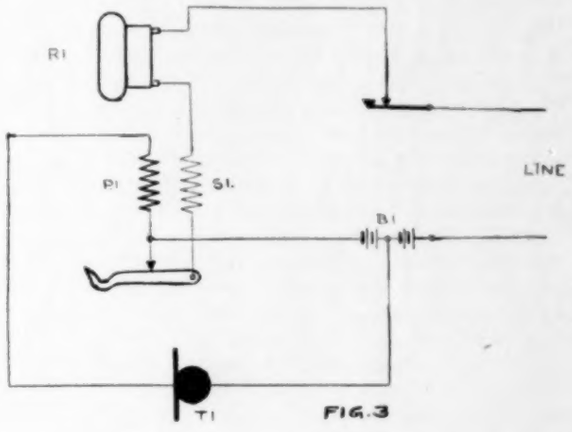


FIG. 3

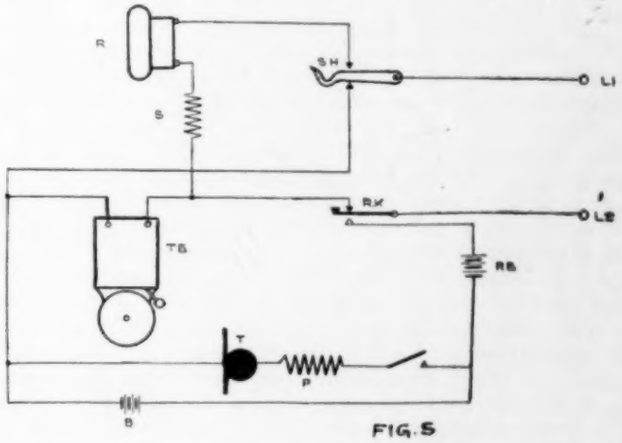


FIG. 5

The circuit is as shown in Fig. 1, the action being as follows: In the normal condition both hand-sets are on their respective switch-hooks, so that the springs of *S* 1 are opened and those of *S* 2 closed. When the ringing-key, *R* 1, is pressed the trembler bell in the kitchen is actuated by the battery, a short circuit being thrown across the line. After both hand-sets have been lifted from their switch-hooks the springs change the contacts, so that the circuits are through for speaking. The short

is taken off the kitchen hand-set and the circuit is put through to the dining room hand-set, so that we get the two transmitters, the two receivers, the bell, and the battery all in series. This circuit can be easily traced from the diagram of connections.

In the dining room a press-key can be inserted in the hand-set handle to replace the hook-switch *S* 1, and this form is indicated in the diagram.

These sets are only of light construction and inefficient in working, so that where a reliable system is required, such as between offices, from a manager to a subordinate, etc., the following is generally adopted: The instruments are arranged so that ringing can be done in both directions, which necessitates the fixing of a trembler-bell and a ringing-key in each station, and the adoption of instrument circuits similar to that given in Fig. 4, which, it will be seen, is far more complicated than that of Fig. 1.

In the previous circuit (Fig. 1) the speaking is carried on through the bell, which offers a considerable impedance to the speech currents, so that the transmission efficiency is materially reduced. In these higher class instruments there are fitted additional springs in the switch-hook, so that in the speaking condition the bells are either cut out or short-circuited, the latter process being generally adopted.

The circuits are more complicated, and will be taken in two stages: (*a*) ringing; (*b*) speaking condition.

Fig. 2 gives the arrangements of the circuits when the hand-sets are on their switch hooks—i. e., in the normal or ringing condition. The batteries in the two stations are joined up, so that the positive poles are connected to the same line, in which case they are acting in opposition, and no current passes. If, however, one of the ringing-keys is pressed, then a short-circuit is thrown across the line, and the distant instrument trembler-bell will ring by its own battery.

The speaking condition is as shown in Fig. 3, the hand-sets being, of course, raised from the switch-hooks and the press-keys in the hand micros depressed. In the first place it will be noted that the trembler-bells at both stations are short-circuited by the switch-hook springs.

Considering the line circuit, it will be observed that, neglecting for the moment the opposing batteries, the receivers *R* 1 and *R* 2, and the secondaries *S* 1 and *S* 2 of the induction coils are thrown across the line at either instrument. The hand micro, press-key being down, current will pass from the battery *B* 1, through the transmitter *T* 1 and the primary *P* 1 of the induction coil. When the transmitter is spoken into, the diaphragm (generally of carbon) is caused to vibrate in accordance with the sound-waves impinging upon it, and this varies the resistance of the transmitter, owing to the variation in the conductance through the carbon granules in the transmitter cell. This variation is largely due to the changes in the areas of contacts between the granules, resulting from the more or less pressure of the diaphragm upon them. While speaking into the transmitter we, therefore, get fluctuating currents passing through the local circuit comprising the transmitter and induction-coil primary.

The induction coil consists of two windings wound on a bobbin having a core composed of soft iron wires about No. 24 S. W. G. The inner winding is known as the primary, and is almost invariably of one ohm resistance, while the outer winding, the secondary, is generally of 25 ohms resistance, although sometimes much higher than this.

The fluctuating currents passing through the primary of the coil cause corresponding fluctuations in the magnetic state of the core, owing to the varying magnetic effect of the primary current. The change in the magnetic state generates alternating currents in the secondary winding of the induction coil by magnetic induction. These currents, which may be termed the speech currents, pass through the receiver *R* 1, reproducing there the speech originally spoken on to *T* 1, and giving the effect known as "side-tone." The speech currents will also travel along the line wires, and, passing through the windings of the distant instrument receiver, *R* 2, cause varying magnetic pulls on the iron diaphragm, which therefore vibrates in a similar manner to the transmitter diaphragm, *T* 1, so that sound-waves are propagated from it, and the original speech is, therefore, reproduced.

The complete diagram of connections, showing both the ringing and speaking facilities, is given in Fig. 4, from which the previously discussed circuits can be easily traced out. It will be noted that additional cells are used for ringing than for speaking. This is due to the fact that the current with which a transmitter will work is limited to about 1/10 ampere, a greater current than this causing unpleasant sizzling and frying noises in the transmitter, and thus greatly decreasing the transmission efficiency and the quality of the articulation. Two Leclanche cells give the most suitable current with ordinary transmitters.

For ringing, however, over lines of two or three miles in length greater battery power is required, so that additional cells are installed, and the transmitter circuit tapped of the first two cells, as shown on the diagram.

Another important feature about this circuit is that if the switch-hook becomes faulty, due to dirty or burnt contacts at the springs, etc., the circuit is still operative, the bell being actuated through the receiver and induction coil secondary, when the speech currents pass through the receiver, secondary and bell, the last, of course, cutting down the volume of the speech, but still allowing of fair transmission. This effect is obtained by using the short-circuited method of connecting up the instruments, instead of the cut-out or switch-over method, the receiver circuit or bell is cut out as needed.

Fig. 5 gives another type of battery-ringing instrument, in which the ringing is produced by throwing the battery across the line instead of short-circuiting the line terminals. This circuit has the advantage (*a*) that the batteries at the two stations need not be connected to the line in a specified manner. This latter point means issuing special instructions to the installer of the telephones, and also special care after the cleaning or renewal of batteries; and (*b*) owing to the batteries being off the line normally no trouble, due to the bells constantly tinkling, etc., can be given, due to their being out of balance.

Approximately 48 per cent of the total number of telephones in New York City are in private branch exchange systems, the minimum charge for which is $204. This amount is arrived at by making a charge of $36 for the switchboard, $48 for the two trunk lines, $12 for two extensions, and $108 for service, allowing 3,600 calls a year. This makes the average cost a call at little less than six cents in New York. Additional calls are paid for at the rate of $3 a hundred.

The Unpaid Chattel Mortgage

A Popular Talk on Some Features of Law Not Universally Know Among the Laity

BY WALTER K. TOWERS

THOSE who are fortunate enough to be possessed of real estate have an available security when they seek to borrow money. But there are others of us who find occasion to seek an extension of credit who do not own land, or whose land is already incumbered by a real estate mortgage. Such a one may secure a loan by giving a mortgage on the family horse, or the farm machinery, or the stock in his store, as security.

Whether the paper which he signs as a mortgage transfers the title to the lender, giving him only the privilege of regaining the ownership by repaying the loan, or whether the paper simply gives to the lender the privilege of taking the property if the debt be not paid, is not of vital interest to the average borrower as long as the result is practically the same. The courts of some states proceed along the theory that a mortgage does one thing while those of the others take the opposite view. This difference in legal theory is not likely to affect the man who gives a mortgage on his property very directly, unless that property is a female animal. Every stock owner is familiar with the rule of law that the offspring of domestic animals belong to the owner of the mother. So a calf or colt will belong to the borrower or lender according as the one or the other is looked upon as having title to the mortgaged animal in that particular jurisdiction. The practical and proper way to meet the difficulty is to avoid it by agreeing beforehand on this point and having it specified in the mortgage itself.

The points which interest a man who has given a chattel mortgage on his movable property as security for money due are with regard to the payment of the mortgage or the consequences in case he finds himself unable to pay on time. It is usually specified in the mortgage that the man who gives the mortgage on his property, who borrows the money,—in law he is called the mortgagor—is to retain possession of the property covered by the mortgage. In the terms of the mortgage title is transferred to the man who receives the mortgage, and lends the money—the mortgagee. In practical effect the mortgagee has a superior sort of a claim on that property to protect his loan. If the loan is not paid in full then he may enforce his claims against the property.

When the debt which the mortgage was given to secure is paid in full the claims of the mortgagee to the property are destroyed and the mortgagor's title again becomes complete. When the borrower takes the money due in good and lawful currency—any money which is legal tender—and tenders it to the person to whom the money is due, on the day and at the place specified in the mortgage, the chattel mortgage is discharged. The amount must be the debt together with all proper interest charges and it must be definitely offered to the mortgagee—held out before him. Though he refuses to accept it the mortgage will, in most circumstances, be discharged by this tender. The debt will still remain due but the mortgage on the goods will be discharged and they will be free from incumbrance.

If the holder of the mortgage, the mortgagee, has transferred it to another, and the mortgagor has been notified of it, he should, of course, make the payment to the present holder of the mortgage. But if he has received no notice of the transfer and in good faith pays the money over to the person to whom he gave the mortgage, he will be protected and the mortgage held discharged.

It may be that both parties feel that the mortgaged property is worth just about the amount due and the mortgagor is willing to have the mortgagee take it in full settlement and that the mortgagee is willing to receive it. If this is done under a definite agreement the mortgage is discharged.

In most states it is held that once the mortgage has become past due, the mortgagor having failed to pay it in full at the time specified, the holder of the mortgage has become the owner of the property and has the right to claim it without further ceremony. It is only necessary that he claim it and take possession in a peaceable manner. In a few states, as Michigan, Nebraska, North Dakota, Oregon, Texas and Washington, regular foreclosure proceedings are necessary before the holder of a chattel mortgage can take possession of the property.

But even though the mortgage debt is overdue, and the holder has taken possession of the property the mortgagor's rights are not at an end. He still has what is known as an equity of redemption—that is, he has the right to redeem the property by paying all the money due, including principal, interest and necessary expenses. The time within which one may redeem after the day when the mortgage was due, known as the period of redemption, is fixed in a few states by statute, as in Maine, Massachusetts, Minnesota and Rhode Island, where it is sixty days and Kentucky, where it is five years. In other states the courts allow "a reasonable time."

The mortgagee, the holder of the mortgage, has it within his power to cut off this equity of redemption. He may bring foreclosure proceedings in a court of law by which the mortgage is definitely closed. By these proceedings disposition is made of the property at a mortgage sale under the direction of the court. From the proceeds the expenses of the sale are paid, the amount due the holder of the mortgage under the mortgage is paid, and any balance remaining is returned.

By the terms of many mortgages of movable property the holder, after default of payment, has the right to conduct a public sale of the property for himself, without having recourse to foreclosure proceedings. This sale must be fairly conducted in every regard, and should always be by public auction, though private sales are sometimes countenanced or agreed to by the mortgagor. The proceeds of the sale are disposed of in exactly the same manner as after a sale on foreclosure. Either a foreclosure or a sale under a power in the mortgage cuts off the equity of redemption.

Thus it is to be noticed that the mortgagor—the man who gave the mortgage—has a very real interest in the property, even after the mortgage is overdue. If it is worth more than the debt the surplus must be returned to him, and so he has an interest in seeing to it that the sale is fair and for the highest possible amount. Notice should always be given the mortgagor of the sale of the mortgaged goods in time so that he may attend. If the goods do not bring enough to pay the debt due the mortgagor is personally liable for the balance.

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How Manager Should Deal with Public

In dealing with the public there is but one fundamental principle involved and that is to satisfy them, says J. E. Bonell, manager of the Bell Telephone Company at Eau Claire, Wis., in *Public Service*. To accomplish this end we must bear in mind at all times that we are employes of a public utility, dealing with the public in general and are therefore to a certain extent public servants. The position of a commercial employe in this regard is somewhat different from that of a plant or traffic employe inasmuch as a great percentage of our dealings are face to face where the employes of the other departments confine themselves to a greater extent to their conversations over the telephone.

It is no doubt the latter condition that at times makes the task of the commercial employe the harder. To illustrate: The traffic department is the one with which the public comes in contact most frequently and any complaint of service generally originates in this department.

It is very often the case that the subscriber gets into such a frame of mind that any little inattention will be readily magnified to the extent that he will feel that his service is neglected, and, if the tone of voice used by the operator does not have the rising inflection he will immediately note it, and add to his complaint.

This and other matters which may arise from time to time such as collection, charges for moves, overtime on toll messages, etc., have a tendency to bring the matter to the commercial department, either as a first or last resource, and it is usually the case that by the time it does reach the commercial department (especially traffic complaints), it has worked upon the mind of the patron, to the extent that he forgets himself for the time being, and allows his temper to get the best of him.

At this stage the commercial employe must remember, as I stated before, that he is the employe of a public utility and a public servant who has been placed in his present position by his employer, to act as a representative of the company, and the greatest task is to satisfy the public. Never allow the spirit shown by the party making the complaint to invade your methods, remember at all times that "the pleasant voice turneth away wrath," and above all display to the greatest extent your interest in the particular complaint, as nothing adds more to the dissatisfaction of the party complaining than to have his complaint received with indifference.

By showing interest in his case and explaining in detail the different workings of our business, which directly affect his complaint you will find that the result obtained is a thoroughly satisfied patron and one by whom, in the future, the small irregularities will be overlooked.

Every day of our lives we have some case similar to the above, and though it may not be due to the same causes, when it is brought to our attention the same methods in handling it should apply.

If the subscriber should call over the telephone, rather than to make a personal call at the office, we should follow out the same principle in endeavoring to satisfy him or her in the most pleasant way possible, bearing in mind always that the handicap is much greater than it would be if we were conversing with them face to face. If we ourselves are not absolutely sure that the proper result has been obtained, a note should be made and a personal call will secure the result in a majority of cases.

I enumerate below a number of the very important items to be considered in securing that desired result, "a satisfied patron."

Always retain your self poise and never allow your temper to get the upper hand of you.

Always give every complaint your very earliest attention.

Never make a note of a complaint and then throw the note aside without giving it proper attention.

Always report promptly to the subscriber the result of your findings, as to overlook this will add to his dissatisfaction.

Never make any promises that cannot be fulfilled. (This would apply principally to solicitors or other employes securing contracts or change orders.) Bear in mind always that it is the first impression that remains with a patron and any promises not kept tend to place him in an antagonistic frame of mind from which recovery is slow.

Tripoli's New Telephone Lines

A telephonic service has been in operation for all government offices for over a year in Tripoli, Libia, North Africa, and its immediate suburbs. Not until recently has there been a demand for the installation of telephones for private use. To meet this demand the local management of the postal service has invited private parties to send in their requests for installation of telephones in their offices and houses. Very nearly 100 have responded. A report is being prepared by the director of the postal service to the ministry of colonies, which will recommend that the telephone service be extended to private parties.

It is possible that a concession will be granted to a private company to install this service, to be operated under the government telegraphic and postal direction. In that case all supplies for the system would be purchased by this private company. Should the government install the service it will be necessary for American exporters to have their representatives in Italy get in touch with the ministry of colonies.

The advice is offered to all parties interested in projected public improvements in Libia to have their agents in Rome keep posted through the ministry of colonies. In this way information can be secured much sooner than through reports from Tripoli.

Uncommon Uses of the Telephone

It is amazing to consider how much the telephone has done to forward modern business enterprise, says the *Christian Science Monitor*. It is said that in the process of refining oil the Standard Oil Company, at its New York office, alone sends 230,000 messages a year. In making steel, a chemical analysis of the iron at a certain stage is made and telephoned to the steelmaker, so that he will know how each potful is to be treated. In floating logs down a river a telephone wire is strung and a telephone set at very troublesome point, to take needed instructions from man to man. Temporary wires are strung in tall buildings while they are being built to carry the messages from story to story. The architect stands on the ground and talks with the foreman 300 feet in the air. The railroads waited 15 years before they would trust the telegraph to carry orders correctly. They have only recently begun to rely on the telephone for sending orders. Since 1907 it has come more and more into such service.

The Law and the Telephone

How Telephone and Other Public Utility Matters Are Treated in the Courts

BY E. J. WENNER

JOHN SYKES, administrator, of Portland, Michigan, brought suit in the Circuit Court of Ionia county against the village of Portland and Citizens' Telephone Company asking damages for the death of his son, John Sykes, Jr.

It appears that in the year 1896 the village of Portland erected and commenced operating an electric lighting plant used both in municipal lighting and in furnishing light and power to private consumers. It erected and maintained poles and wires on certain streets and alleys.

In 1902 a franchise was granted the Citizens' Telephone Company to erect and maintain telephone poles, wires and equipment for conducting an electric telephone system in the village.

From that time on until the time of the injury above mentioned, the village conducted the lighting system and the telephone company operated its exchange, both plants making use of the streets and alleys in the village.

Near the intersection of Brush street and an alley, both the village and the telephone company erected and maintained poles upon which they strung wires belonging to the village lighting plant and the telephone company. These poles and wires were so arranged, and so installed, that the wires of the telephone company were strung over and above the electric wires of the village. Within a few feet of a point where the telephone wires crossed over the electric wires, the telephone company had placed a pole. It seems this pole was not guyed, and that at a time about a year prior to the accident above mentioned, it had in some manner become loose, had swayed and the wires had come in contact with the electric wires below. This had resulted in the insulation being burned from the electric light wires. The pole was later straightened, but the insulation was not repaired.

On April 21, 1909, a high wind had been blowing and it resulted in the displacement of the above mentioned telephone pole. It seems that the telephone wires again came in contact with the electric light wires. The result was the burning off of one of the electric light wires and it recoiled in such a manner as to obstruct the path or passageway on Brush street.

About four o'clock in the afternoon John Sykes, Jr., a boy between nine and ten years of age, while playing on Brush street came in contact with the live wire and was instantly killed. Action was brought against both the village and Citizens' Telephone Company, claiming damages on account of the alleged negligence of both concerns. It was claimed that the village was negligent in allowing the telephone wires to be so placed as to be near the electric light wires and to come in contact with them. It was also claimed that the telephone company was negligent in so locating its wires.

The village alleged that as it was first on the ground with its poles and wires any negligence resulting in the death of the child was the negligence of the telephone company. The plaintiff claimed that a duty devolved upon both the village and the telephone company to see that their wires did not come together and burn off and fall to ground. Upon this proposition the court used the following language:

It is true that it was the duty of the Citizens' Telephone Company, when it erected its poles and put up its wires, to use all necessary precaution to keep the wires from coming in contact with the highly charged wires of the village of Portland, but it does not by any means follow as a legal consequence that the existence of that duty relieves the defendant, the village of Portland from its duty in the premises. If it knew that these wires were in close proximity to each other, or that the poles of the Citizens' Telephone Company were sagging and bringing its wires in closer proximity, it should have taken steps to relieve the situation from danger and not have remained inactive simply because some other company had come to have a legal obligation to the public imposed upon it. If, after the village of Portland, defendant placed its poles and constructed its wires, new facts or conditions arose, making, in view of them, its first construction dangerous to the public, then it was their duty to have acted and so arranged their wires as to have rendered it improbable of contact at a point where it would be dangerous if it remained. If the situation was such as would have enabled the village of Portland to have forced by request or otherwise the Citizens' Telephone Company to remedy the evil, then it was the duty of the village to make such request and see that the evil was remedied. If it failed of success in that regard, it should have applied some proper remedy itself.

It is plain to be seen that the law as laid down by the court requires the village officers in charge of its lighting plant to remove the danger, or cause the same to be removed by the telephone company. This duty being the same whether the village or the telephone company was first on the ground.

The judgment in the court below was for $1,200.00 in favor of the plaintiff and was affirmed.

Sykes v. Village of Portland and Citizens Telephone Company (Michigan), 143 *Northwestern Reporter* 326.

SHADE TREES ON PUBLIC STREETS OR HIGHWAYS—RIGHT TO TRIM BY TELEPHONE COMPANY—SOUTH CAROLINA DECISION.

The courts have always adopted the same rules with reference to the rights of power companies and telephone companies to trim trees on streets and public highways.

The Supreme Court of South Carolina has recently decided a case of this kind wherein the Carolina Power & Light Company is the defendant, mention of which is made in the following:

Plaintiffs were abutting of property on a city street. An electric light company, for the purpose of facilitating the use and operation of its lines and poles, sought to so trim as to materially damage certain shade trees bordering on the street in front of plaintiffs' property. Suit was brought for damages alleging depreciation of plaintiffs' property because of the impairment of its use and enjoyment resulting from the above depredation. The defense was interposed that as the fee in the streets belonged to the state, and as defendant company was a quasi public corporation, plaintiffs had no rights against the company that could interfere with any impairment of the trees for its convenience. The Supreme Court of North Carolina, however, while holding that a municipal corporation which enjoys the possession of its streets has absolute control over bordering trees providing that no oppression is exercised impairing the rights of abutting owners in their easements in the shade of the trees, yet decided that this municipal power of control was not delegable, and could not be conferred upon even a quasi public corporation, with the result that defendant company was required to stand for any damages resulting. Moore v. Carolina Power & Light Co., 79 *Southeastern Reporter*, 596.

INJUNCTION TO RESTRAIN CONFISCATION—EXTRA TERRITORIAL EFFECT OF WRIT OF INJUNCTION.

There has been existing between a railroad company and the Western Union Telegraph Company a contract whereby the telegraph company was allowed the privilege of the use of the rights of way of the railroad company for the operation of its lines and poles. This contract recently expired and no renewal was made. The railroad company then notified the Western Union people of the termination of the contract and that on a certain date they would appropriate the latter's poles and wires. In the meanwhile condemnation proceedings were instituted by the telegraph company in the various states where its wires occupied defendant's right of way, for the purpose of condemning the right to use the same, and, in order to prevent irreparable injury resulting from the railroad company's present action, sought by injunction in the federal District Court for the Western District of Kentucky, to restrain such threatened action pending the condemnation proceedings. The court not only restrained the threatened appropriation of plaintiff's wires and poles in Kentucky, but also extended the injunctions to operate in other states where such wires and poles occupied defendant's right of way. This is upheld by the Circuit Court of Appeals upon the ground that otherwise injury to the public at large would be the result, and justified its reaching out beyond its jurisdiction upon the equitable maxim that "equity acts in personam, not in rem," and that, too, in cases other than fraud of trust or contract.

In this case it was argued with a great deal of earnestness that the writ of injunction had no extra-territorial force, and that it was limited to the jurisdiction of the court within which it was granted, and it was claimed that such jurisdiction did not, and could not, extend beyond the boundaries of the state. The court in passing upon the question of its own jurisdiction decided that it had the right to prevent the confiscation of the poles and wires of Western Union Telegraph Company, both within and without the state of Kentucky, wherever same were upon the grounds of the L. & N. R. R. It must be borne in mind that the notice served by the railroad company contemplated confiscation over their entire system whether within or without the state. Louisville & N. R. R. Co. v. Western Union Telegraph Co., 207 *Federal Reporter*, 1.

FAILURE OF TELEGRAPH COMPANY TO TRANSMIT AND DELIVER MESSAGES—ACTION FOR DAMAGES—RIGHT TO COLLECT ON UNCOMPLETED CONTRACT OF SALE.

The plaintiff in this action was a resident of Burlington, Iowa, with a branch office in Keokuk, Iowa. Plaintiff was desirous of purchasing a quantity of apricots, and on April 26, 1910, delivered to the defendant, Postal Telegraph Company, at its office in Keokuk, Iowa, a message in the following words: "Telegram received. Buyers confirm at prices named therein." This message was addressed to Phoenix Packing Company of San Francisco, California, and was in answer to its telegram offering, subject to confirmation, a certain quantity and description of apricots at a specified price.

Plaintiff claims that his telegram was never transmitted or delivered to Phoenix Packing Company. In this he is supported by the last named concern. He seeks damages in the sum of $400.00 with interest at 6 per cent per annum, claiming that on the strength of the Phoenix telegram he sold apricots at a specified price and was obliged to buy them elsewhere at a higher price in order to fill the order. His loss he claims to have been $400.00.

The telegraph company defended on the theory that plaintiff was not damaged for the reason that his telegram was not an acceptance of an offer, and that the two above mentioned messages taken together would not constitute a valid and binding contract, and that inasmuch as there was no valid contract, damages could not be recovered.

The court held that there was not a completed contract, but there was sufficient evidence to show that had the telegram been sent to addressee, it would have shipped the goods, as per the order, and that plaintiff would have received them in ample time to fill his contracts with his customers, and that a failure to receive the goods resulted in damage claimed. The case was reversed and sent back for retrial.

Storrar v. Postal Telegraph Cable Co. (Iowa), 144 *Northwestern Reporter*, 363.

A New Dishonesty

A new form of dishonesty in the use of the telephone came to light a few days ago in New York City. Anonymous telephone calls were received by newspaper offices, stock exchange houses and others interested in finance. In each instance an inquiry was made as to the financial standing of some important business house. The usual form of inquiry was something like this: "Is So-and-So in trouble?" or "Has the failure of So-and-So been announced yet?" This persistent telephoning made traders timid and even brokers became infected with the prevailing timidity. A New York paper, which tells of the incident, says that one of the firms mentioned in the telephone messages has extensive foreign connections and that, on the day when the telephone was most used in order to create a feeling of distrust as to its stability, this house had a bank balance of $1,900,000 and more than $3,000,000 out on call and time loans.

James B. Mabon, president of the Stovk Exchange, has issued a statement asking for assistance in tracing the responsibility for the telephone calls, with the purpose in view of placing the matter before District Attorney Whitman. According to Mr. Mabon, several houses of established reputation have been mentioned freely in these telephone talks and a systematic effort made to injure their business. Under the New York law this offense is punishable, and the intention of the Stock Exchange is to bring the culprits to justice.

With the multiplication of safeguards that the genius of telephone people has been able to throw about the operation of their business, the use of the telephone has become increasingly dangerous to evil-doers and, for this reason, there is not the slightest doubt that the New York miscreants will be captured if they persist in their course.

Railroad Wanted Pay for Telephone

The Burlington Railroad Company presented a bill to the Stella Telephone Company not only for rental space in its depot at Shubert, Nebraska, but for pay for its employees who answered the telephone. The Nebraska Railway Commission has ruled that under the Bartos law the railroad company cannot collect, but on the contrary the telephone company can collect from the railroad company the regular subscription price of a telephone in the depot from the date the Bartos law went into effect, April 2, 1909.

The commission is holding a hearing on the application of the Sarpy County Mutual Telephone association for leave to increase its rate from $1 a month to $1.50. The company has sixty telephones, all being used by farmers except one in a depot at Richfield. Last year its gross receipts were $800 and its operating expenses $790.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

The Dry Cell

Local battery subscriber telephone sets, which are most frequently used on rural telephone lines, must be equipped with batteries to supply current for energizing the transmitters. In the early days of the telephone various types of wet cells were used for this purpose, but they gave trouble because the liquid "electrolyte" had a tendency to cause corrosion of the connections in the set, considerable work was involved in the installation of new cells when the old ones were worn out, and frequent attention was also required to keep the cells in working order.

The so-called "dry" cell did not have these objectionable features, and was therefore found to be much more suitable for use in the local battery telephones. At the present time this is one of the principal uses to which the dry cell is put.

Fig. 1 is an illustration of the familiar Blue Bell cell, while Fig. 2 shows its general construction, which is typical of that of other types of dry cells. It consists of a cup of sheet zinc (*A*) having a lining of a thick piece of paper (*B*), similar to blotting paper, with two discs (*CC*) of this paper in the bottom of the cup. In the center of this cup is placed a carbon rod (*D*) and all the space between this rod and the paper lining is filled with a mixture (*E*) known as the "depolarizer," although more commonly spoken of as the "filler" or "mix," which consists of several chemical naterials. This mixture is packed in tightly, by a special machine developed for the purpose, to within about one inch of the top of the zinc cup. The paper lining (*B*) is then folded in from all sides toward the carbon rod and flattened down in order to prevent any possibility of the depolarizer touching the zinc cup, as this would short circuit the cell. A layer of clean dry sand or sawdust (*F*) is placed above the lining, on top of which is poured a seal of pitch (*G*) from ⅜ to ½ inch in thickness, completely filling the zinc cup. Binding posts (*HH*), attached to the zinc cup and to the end of the carbon rod, are supplied to connect the cell into a circuit. Before shipment from the factory, the cells are placed in the familiar cardboard cartons as shown in Fig. 1.

Fig. 1.

The depolarizer consists of a finely pulverized mixture of carbon and a chemical called "manganese dioxide." These are first mixed together dry and then moistened with electrolyte. The electrolyte usually consists of water in which are dissolved two chemical salts, ammonium chloride (commonly called sal ammoniac) and zinc chloride. The depolarizer, when moistened with the electrolyte, resembles the moulding sand used in foundries, both in dampness and appearance.

The principle involved in the action of the dry cell is the same that which was explained in the preceding talk on wet cells, namely; when two electrodes

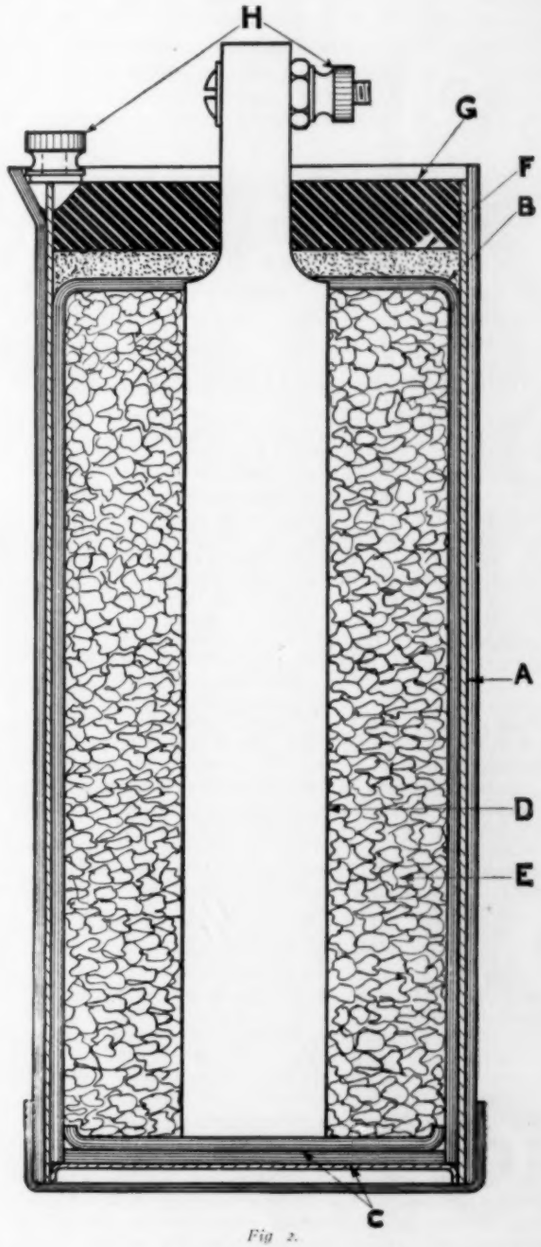

Fig 2.

or plates of dissimilar metals, or other materials which will carry current, are dipped into an electrolyte, or exciting fluid, an electric pressure, or voltage, is established between the two plates; and if the plates are connected together with a wire, an electric current will flow through

the wire from one plate to the other. In the dry cell the zinc cup forms one electrode and the carbon rod surrounded by the depolarizer forms the other electrode, the two being separated by the paper lining of the zinc cup. The electrolyte in the depolarizing soaks through the paper lining and attacks the zinc, enabling the cell to deliver current. When the cell is connected into a circuit, current flows from the binding post on the carbon electrode through the circuit and back to the binding post connected to the zinc electrode. The dry cell has a voltage of approximately 1.5 when new.

Although it was stated above that one of the principal uses for dry cells is in telephone instruments, they also have other uses in the telephone field, such as for furnishing ringing current in small exchanges where pole changers are employed to ring the subscribers' bells; for testing the telephone lines coming into an exchange; and for the operation of inter-phone or house telephone equipments. Dry cells have also replaced to some extent gravity and other types of wet cells for furnishing the operators' talking current in small exchanges. Dry cells are also used extensively for other purposes, such as the operation of bells or other signals, the ignition of gas engines, etc. The large variety of uses for dry cells has led to the development of different types, each of which is suitable for a particular class of service.

Work of the Service Department, I. T. A. A.

Editors Telephone Engineer:—The Service Department of the Independent Telephone Association of America is proving of great value to the member companies who are taking advantage of the benefits which are available.

During the past two months several operating conferences have been held in the various states and the large attendance of operators at each meeting and the interest manifested demonstrates without doubt that practically all companies are becoming more progressive and are endeavoring to improve both the local and long distance service. Not only the operators attend these schools of instruction, but the managers as well will spend the greater part of the day at a conference, and after learning of the great possibilities for bettering the service and increasing the toll business they invariably become strong supporters of standard methods and of the Service Department.

The operating schools are held under the direction of Secretary W. S. Vivian and are only a small part of the benefits which are offered members, for as has been stated heretofore, we are in a position to furnish advice on any problem which may confront a telephone company. For instance, engineering, traffic, commercial, legal and other questions are being promptly answered and any number of them have been referred to us for solution. It might be of interest to companies who are now in need of assistance in some manner to know of some of the ways in which the department has been of value to member companies who have made inquiry, and a few specific cases are cited where advice and assistance have been rendered which ordinarily would have involved the expenditure of considerably more than the dues which are being paid into the Association for membership.

Floor plans have been furnished a Wisconsin company for a new exchange. Information in regard to the proper originating commission that should be paid and other advice has been furnished an Oklahoma company. One of our members in Oklahoma who wished to rehabilitate an entire plant including cable work was furnished complete information covering this work and a letter has been received showing great appreciation for the assistance rendered. The fullest possible information has also been secured for an Illinois member who expected a high tension line to be constructed which would parallel the company's toll lines. This company was seeking advice in regard to what recourse it had in the matter and was fully advised promptly. An Indiana company recently has been furnished information in regard to the proper installation for an underground system. This same company was also put in touch with competent accountants to take care of certain accounting which was necessary. One of our eastern members was recently seeking advice in regard to methods for increasing the toll business. This company consulted the Service Department and was furnished information that has increased its toll business to a great extent. The company is highly pleased with the results obtained through the Association and has requested us to refer any company interested in this subject to it for reference in regard to the benefit the Service Department has been to it. A commercial company in Illinois recently called on us for advice in regard to presenting certain facts to the Public Utility Commission. Decisions of the various commissions in other States were secured for this member in order to assist in presenting the matter beore the Illinois Commission. This particular company had made considerable effort to secure the information from other sources before calling upon our Association and we have been complimented on the assistance that has been rendered in this case. One of our members in the state of Washington has been advised fully as to the proper protection against lightning. Another Washington member has written us for advice on the proper methods of accounting and has been fully advised. Contracts covering both local and long distance service have been forwarded to many of our member companies who were looking for this class of information, and other companies, too numerous to mention, have been rendered assistance in a great many other ways.

Therefore, it has been conclusively shown that the service branch of the Association is going to be a big factor in assisting the independent operators in improving their service as well as benefiting them otherwise; and from the expressions of both operating companies and manufacturers it is hoped the work will be permanently carried on regardless of any new physical connections which are made or any other changes which may take place at any time. Every independent operating company should be affiliated with the Independent Telephone Association of America. The dues are only $5.00 per year with unlimited benefits. By your company taking out a membership in our organization you will secure benefits which will many times equal the dues paid for membership. Every member company should also get its neighboring companies interested and in this way create the spirit of co-operation, and through the Service Department be in a position to standardize from an operating point of view in addition to carrying the best insurance possible.

The standard long distance operating instructions are being adopted by companies in many states and are being furnished to members at 25 cents per copy and to non-members at 50 cents. They will put you right in regard to the proper methods for handling your long distance business.

Every member of the Association is urged to write the Service Department whenever information or advice of any character is desired.

Frank L. Eldridge, *Manager, Service Department.*

Automatic Publication Completes First Year

With the May issue of *Automatic Telephone*, just off the press, the publication issued monthly by Automatic Electric Company of Chicago completes its first volume.

In form and material this periodical has been, in many ways, unique, and has struck a new note in the telephone field. While frankly published in the interest of the automatic telephone apparatus manufactured by this company, the articles appearing in it have been designed to interest telephone men in general, whether connected with automatic or manual plants. The range of subjects covered has been wide, and treated matters of importance not only to the operating department, but to directors and commercial men as well.

Articles of a financial character, dealing with operating costs, security issue and the like, have appeared from time to time, while three series of articles have been especially notable. One of these, on the fundamentals of the automatic telephone, by Arthur Bessey Smith, an Automatic Electric Company engineer, has told in simple language and careful illustrations, of the electrical asd mechanical details of this apparatus.

"Development Studies," written by Bernard C. Groh, the company's plant chief, has dealt with the

economical and efficient layout of the cable plant and other kindred matters in a way which should prove of interest and real value to men engaged in this work.

Roy Owens, superintendent of the operating department of Automatic Electric Company, is the author of the series on "Scientific Management of the Telephone Exchanges," and has detailed many methods for the efficient conduct of the operating branch of this utility. While special stress has been laid upon automatic apparatus in this connection, the articles have contained much that should appeal to manual men as well.

The form of the publication, that of a newspaper, is a novel one in this field, but has been consistently adhered to. The first page with its array of "news" heads has been full of "stories," many of them of timely interest to the telephone world in general, and while no attempt has been made to conduct a "funny column," the humor of the game has received attention in many little anecdotes and stories tucked away in odd corners.

Typographically, the paper has been excellent, being printed in good, clear type on a high grade of paper.

Automatic Electric Company announces its intention of continuing the publication of *Automatic Telephone* during the coming year. The present form will be continued, but certain new features are planned which, the company hopes, will render the periodical even more interesting than before. The paper is distributed free to those interested in telephone matters and the Automatic Electric Company invites those who wish to receive it to send in their names and addresses.

The Diamond Crimper

A new crimper for attaching aerial rings to messenger strands for supporting lead cable on poles has been placed on the market by the Diamond Expansion Bolt Company, 90 West street, New York.

This crimper is claimed to be the most powerful tool of the type that has ever been introduced. A compound lever and rocker motion forces the jaws of the tool over the bent end of the aerial ring, binding it tight on the messenger strand.

Diamond Crimper.

The tool is attractive in design and is furnished with three sets of case-hardened steel jaws milled to suit the three standard diameters of messenger strands commonly used by telephone companies. At a very slight expense for new jaws to replace those worn in service, the tool can be put in as good condition as new.

Convenience in operation is one of the principal points considered in the design of this tool. The handle and lever which operates the jaws are both located on one side of the strand. This permits the crimper easily to be passed through trees, thus overcoming a serious objection to other types now in use.

Bell Gives Up Independent Interests on Coast

The combination by which the Bell system dominated the lines of Washington, Oregon and Idaho was dissolved at Portland, Ore., March 26, when a decree accepted by the telephone interests and conceding the government's demands was entered in the Federal court.

The decree adds another step in the peaceful reorganization of the telephone companies and makes specific plans for the restoration of competitive conditions in the Pacific Northwest. It ends the suit under the Sherman anti-trust law instigated last July by the attorney general.

In compliance with its terms, the Bell Company will give up its holdings in the Northwestern Telephone Company, with lines from Port Angeles, Wash., to Corvallis, Ore., and in the Interstate Telephone Company, with lines from Spokane, Wash., into northern Idaho. The acquisition of those two long distance companies, the purchase of the Home Telephone Company, of Spokane, and of exchanges competing with the Bell in Seattle, Tacoma and Bellingham, Wash., contributed to the alleged combination in restraint of trade which led to the suit.

Concerning the Home Company, the decree offers a novel proposal and makes it possible for the people of Spokane to regulate their local telephone system.

The decree condemns as unlawful all contracts by which local companies agree to give their long distance business to the Bell exclusively and prohibits that company from accepting benefits under such contracts. The usual prohibition is entered against the formation of a like combination in the future.

The American Telephone and Telegraph Company, in reference to the matter, stated that this decree and the working agreement made between the American Telephone and Telegraph Company and Attorney General McReynolds disposes of all existing controversies between the department of justice and the company, and establishes a basis upon which the business of the company may proceed without question as to its legality.

The decree does not disturb any existing established relations where actual merger has taken place between opposition and Bell companies.

In the case of Spokane, where the Bell Company had purchased the securities of the opposition company, but no consolidation had taken place, the Bell Company is ordered to sell these securities unless the local authorities within a fixed time indicate a desire to have the independent company consolidated with and operated by the Bell Company.

In the case of the Northwestern Long Distance Telephone Company, which was a toll line company having some interstate connections, whose securities the Pacific Company had purchased, the decree requires the Pacific Company to sell these securities and also requires it to restore connections with the opposition exchanges which have been merged with the Bell exchanges. It also requires the sale of the Independent Long Distance Company, a small interstate line between Spokane and Idaho points.

Both parties to the suit sought this compromise because they recognized that an adjustment, especially at this time, would strongly serve the public interest.

Automatic System for Washington, Ind.

An order has been placed with Automatic Electric Company of Chicago, for an initial installation of 800 lines of automatic equipment for the New Washington, Ind., exchange, to be established there by the Pike County Telephone Company. This company is now operating systems in Petersburg, Winslow, Otwell and Monroe City, besides a number of rural telephones and approximately 110 miles of long distance lines. Washington is a city of somewhat more than 10,000 inhabitants and is new territory for the Pike County Telephone Company. The company will install an all-cable plant and the construction will be first class and complete in every respect. In fact, it is planned to make this exchange one of the most modern in the country, and it will embody all the newest developments in telephone art and practice.

Rubber Insulation Report

The report of the Joint Rubber Insulation Committee, recommending a well defined method of procedure in the analysis of rubber for insulation and other uses, has just been reprinted by the Simplex Wire & Cable Company, Boston, Mass. The full report of this committee provides a fine method of avoiding misunderstandings in working with rubber analyses, and consists of twenty-four pages. As readers will recall, this report was prepared by a number of interests identified with this subject, including the United States Signal Service and Bureau of Standards, the American Chemical Society, two of the large trunk line railroads and four of the manufacturers of rubber-insulated wires, of which the Simplex Company was one.

Independents Seek Government Aid

A committee of the Independent Telephone Association of America will seek to enlist the department of justice in an effort to secure a favorable contract for toll line service from the American Telephone and Telegraph Company.

This action was decided upon by the committee at a meeting held in Chicago April 14. Officials of the Bell system conferred with the independent association and submitted a form of contract for "qualified toll service" identical with that which has been accepted by the National Independent Telephone Association. The contract form was rejected and the committee appointed to draft a new form as a basis of further negotiations.

Bell and Wisconsin Company Exchange Holdings

The Wisconsin Telephone Company secured permission April 11 to leave Ashland and turn over its property there to the Ashland Telephone Company. Under an adjustment between the two companies and approved by the railroad commission, the Bell Company turns over its exchanges and lines in the city to the Ashland Company, and in turn the Ashland Company turns over its country lines, with exchanges at Mellen and Washburn, to the Bell interests. The Ashland Company also gives the Wisconsin Company $17,500 in bonds, and a similar amount of stock is also given the Bell Company, thus giving it a voice in the affairs of the Ashland corporation.

Western Union-Bell Relation Ended

In compliance with an agreement with the department of justice for the complete separation of the American Telephone and Telegraph Company from the Western Union, the interlocking relationship between the two directorates was ended at the annual meeting of stockholders April 8 by the resignations from the Western Union board of Theodore N. Vail, Union N. Bethel, Lewis Cass Ledyard, John J. Mitchell, John I. Waterbury and Robert Winsor.

Other directors who resigned in accordance with a resolution to reduce the board from thirty to twenty-one were Harris G. Fahnestock, Robert M. Gallaway, Edward J. Hall, Henry S. Howe, Edward T. Jeffery, Charles Lanier and Harry B. Thayer. The new directors elected were William H. Baker, Henry W. de Forrest, William Fahnestock, Percy A. Rockefeller, Mortimer L. Schiff and William H. Truesdale.

The resignation of Theodore N. Vail as president of the Western Union will not take place until the new board meets for reorganization purposes on April 15. It is probable that Newcomb Carlton, ranking vice-president, will be elected to succeed Mr. Vail.

Western Union earned 3.24 per cent on the $99,786,759 outstanding stock in the year ended December 31, 1913, against 3.13 per cent in the year ended June 30, 1913. The company's fiscal year was changed to the calendar year at a special meeting of stockholders last October. Compared with the previous calendar year, the 1913 earnings increased $1,783,512, or 3.9 per cent, and expenses, including leased line rentals, reconstruction, taxes, etc., advanced $1,738,021, or 4.2 per cent.

President Theodore N. Vail, in his last report to the Western Union stockholders, warned them against sacrificing their holdings because of government ownership discussion. In such an event, he declared, they should receive as a minimum a sum far in excess of the present market value of the stock.

The other alternative which has been advanced by the government, to take over the long distance telephone lines and enter into competition with the existing telegraph lines for the purpose of destroying their business, he continued, is not only of so questionable a character as to be repudiated when its full significance is realized, but is so utterly impohsible and unworkable from a practical point of view as to make it negligible.

Savannah to Retain Bell Headquaters

Yielding to the wishes of the people of Savannah, Ga., the Southern Bell Telephone Company has abandoned its plans for transferring the headquarters of the Southeastern division to Jacksonville.

Announcement that the headquarters will remain in Savannah was made by President W. T. Gentry at a meeting of a committee representing the city and trades bodies April 12. The announcement, coming as a complete surprise, was a source of much gratification.

Chicago to Enforce Prompt Payment

A rule of the Chicago Telephone Company which compels all customers to pay for telephone service in the current month will be strictly enforced in the future. This was announced by District Manager John C. Conway. Users of telephones who fail to pay their bills before the 20th day of the month will have their service cut off.

All bills must be paid on the 15th of the month. On that date notices will be sent to delinquents and unless they pay for their service in two days the central girls will be instructed not to call their number. If still on the delinquest list on the 20th of the month, their service will be cut off.

The company has been carrying many customers for two and three months. There has always been a rule that service must be paid for in the current month, but it has never been strictly enforced.

Tri-State to Get Chicago Service

The Tri-State Telephone and North American Telegraph Companies have completed an agreement by which the entire Minneapolis, St. Paul and outlying system of the Tri-State is to be connected with the new long distance telephone service of the North American Company to Chicago. President H. A. Tuttle of the North American returned from New Orleans via Chicago and announced the new plan.

Vice-President A. S. Harris of the North American recently announced that the long distance telephone line of the company from Minneapolis to Chicago, which follows the Soo line's Chicago division, or Wisconsin Central road, was practically completed and that service on lower rate basis than now existent would be established. Local connection in Chicago is a further part of the eventual plan.

Ohio Companies to Make But One Valuation

Interstate telephone companies doing business in Ohio will not have to make a separate valuation of their business for the state public utilities commission if they also make one for the federal interstate commerce commission. This announcement was made at the headquarters of the state commission April 14.

The Ohio branch of the American Telephone and Telegraph Company recently asked the commission to modify its order compelling telephone companies to return their inventories by October 1, in view of the plans being worked out now by the interstate commerce commission to appraise telephone companies.

The date when the valuation must be completed was changed to February 1, 1915. The commission stated this date would be extended even further if the interstate commerce commission's appraisement is being made but not completed at this time.

Cities May Buy Bell Independent Long Distance Lines

Commissioner of Public Utilities C. M. Fassett, commenting upon a report that Samuel Hill, a coast capitalist, wants to go into partnership with the cities of Seattle, Tacoma and Portland in the long-distance telephone business, stated it would be folly for the cities of the Northwest to go into the long-distance telephone business, even should they operate municipal systems.

According to the report, Mr. Hill has offered to make a contribution of 50 per cent toward the capital stock for the long-distance line between Seattle and Tacoma, in case the cities are willing to take the remainder, Seattle 33⅓ per cent and Tacoma 16⅔ per cent. Mayor Gill of Seattle is said to be considering the proposition.

Under the court order of dissolution, the independent long-distance lines on the coast must be sold by the Bell system.

Denver Opposes Municipal Ownership

The Denver Trades and Labor Assembly went on record at its meeting March 22 against a municipal telephone system at the present time, voting with the majority report of its legislative committee that the city has enough outstanding indebtedness.

The legislative committee submitted two reports, the minority report advocating immediate municipal ownership. The majority report, which was adopted in its entirety, while opposing plans for immediate municipal ownership, declared for a reduction in rates.

The committee declared itself unwilling to base any estimates for rate reductions on the Schirmer report, or to attempt to arrive at a fair rate without a complete appraisal of the telephone plant by an impartial committee.

Postal Starts Competition in Washington

With the state public service commission at Olympia, Wash., has been filed by the Postal Telegraph Company a set of telephone rates announcing the inauguration of a new telephone system in the state. The scale of charges is much below that of the other telephone companies operating in Washington.

It is the plan of the Postal Company to use its telegraph wires for the transmission of telephone conversations at the same time the wires are being used for telegraphic messages, this being the basis on which the low rates are established. Every locality in the state that has a Postal Telegraph office or in which one shall be established will be affected by the new system, including Tacoma, Seattle, Spokane, Ellensburg and other cities, and the same rates apply for conversations between Washington points and Portland.

Under the present rates of operating telephone companies, the charge for a message from Tacoma to Seattle, for example, is 20 cents for the first minute and 10 cents for each additional minute. The Postal Company proposes to make a rate from Tacoma to Seattle of 25 cents for the first five minutes and 25 cents for each additional five minutes. A 10-minute conversation between the two cities at present would cost $1.10, and under the Postal Company's rates 50 cents. From Tacoma to Spokane, across the state, the present rate is $1.35 for the first minute and 65 cents for each additional minute, making a total for 10 minutes of $7.20. Under the Postal Company's new system and rates the charge would be $1 for the first five minutes and 50 cents for the additional five minutes, making a charge for the 10 minutes of only $1.50.

The Postal Company has no distributive system in the various cities, making it necessary for the conversations to be carried on directly between the public offices of the company. A call would be put in and a messenger sent out to bring to the company's office the party wanted.

Owing to the fact that this is "new business," a statutory notice to the commission of the new tariffs is not necessary and they are effective as soon as the company desires to inaugurate them.

Tests on Bierce Anchors

In a report of a test made of the Bierce anchor by the Department of Experimental Engineering of Cornell University, Prof. H. Diedrich says: "The rod will break before the anchor can be pulled up."

W. M. Sawdon, instructor in charge of the test, says: "In the first test the eye in the anchor rod failed at about 8,000 pounds. The rod was then threaded and an eye made and screwed on to it. The rod then gave away at the lower end under a load of 13,000 pounds."

In this test a ⅝-inch anchor rod was used and the anchor was set five and one-half feet in earth.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

The firm of McMeen and Miller, which for more than ten years has been conducting a general engineering practice, principally in telephony, has opened a new office at 407 Electric building, Cleveland, Ohio, in order to take care of the increasing activity in telephony in Ohio and adjacent territory. Allen C. Morse, who has for many years been engaged in telephone engineering work, has been chosen as the resident engineer and manager of this new office, which will co-operate with the Chicago office of the firm in the general conduct of its business. Mr. Morse is a native of Cleveland and has had about twenty years of engineering practice. He received his education in the public and university schools of that city, and in the Case School of Applied Science. For about five years after leaving college he was engaged in civil engineering work in its various branches. Mr. Morse's telephone experience began in 1898, when he entered the employ of the Reserve Construction Company (Everett-Moore Syndicate) then engaged in the building of independent telephone plants in all of the principal cities of Ohio. While so employed he had charge of the engineering and construction of a number of important exchanges in Ohio, including those at Mansfield, Findlay, Massillon, and a number of other places. After the Everett-Moore troubles, which occurred late in 1901, Mr. Morse engaged in miscellaneous telephone and civil engineering work, and in 1905 became engineer of the Federal Telephone Company, in charge of the maintenance and construction work of the telephone properties at Findlay, Fostoria, Youngstown, Canton, Alliance, Massillon, Lancaster, Zanesville, and the Columbiana County towns. In 1906 he was also made engineer of the United States Telephone Company, retaining his duties for the Federal Telephone Company as well. In 1907, he was given additional duties as Chief Engineer of the Cuyahoga Telephone Company, and gradually turned over his duties in the other places to others, devoting his whole time to the Cuyahoga Company. While so engaged he made a development study of Cleveland and planned and built the Princeton exchange of the Cuyahoga Company. When the Ohio properties passed into the hands of J. P. Morgan & Company in 1909, Mr. Morse severed his connection with the Cuyahoga Company and accepted a position as first deputy to the city treasurer of Cleveland, continuing in that position until the end of his term in December, 1912. Since that time, until he joined the McMeen and Miller forces, he has been conducting a general consulting and constructing telephone practice in Cleveland. Mr. Morse has devoted much attention to systems of accounting of public service corporations, and to the making of appraisals. He has also operated a number of companies, the plants of which he constructed, and has thus had experience not only in the designing and building of plants, but in their operation and in the establishment of plant records and systems of accounting. In its Cleveland office, McMeen and Miller will continue to serve, not only public service corporations, but municipalities and commissions, as may be required, and will devote particular attention to the rehabilitation of plants, the making of appraisals, the establishment of proper systems of records, and to any other work in which they may properly serve the interests of their clients.

Allen C. Morse.

G. A. Schmutte, commercial manager of the Central Union Telephone Company at Cairo, Ill., died March 14, at the Bondurant Hospital. Mr. Schmutte had served the company since August, 1911.

On April 1, Walter G. Luscombe assumed the position of commercial superintendent for the City Division of the Chicago Telephone Company, succeeding Alfred R. Bone, who has been promoted to general commercial superintendent.

E. C. Sailsbury, formerly district manager of the Lincoln Telephone and Telegraph Company at Beatrice, Neb., has accepted a position with the Bell Telephone Company at Sioux City, Iowa.

Mr. Kline, of Beloit, has assumed his duties as manager of the Wisconsin Telephone Company, at Juneau.

Bernard E. Sunny, president of the Chicago Telephone Company, was elected president of the Commercial Club of Chicago, at its thirty-sixth annual meeting, held April 11.

At a meeting of the directors of the Western Union Telegraph Company, April 16, Newcomb Carlton, formerly vice-president, was elected president in place of Theodore N. Vail, resigned.

H. C. Goldrick, Pacific coast manager, Kellogg Switchboard & Supply Company, San Francisco, has returned from Hawaii.

A. B. Crunden has been appointed as auditor of disbursements of the Chicago, Wisconsin, Michigan State, and Cleveland Telephone companies, succeeding John Uprichard, who resigned to become general auditor of the Central Union Telephone Company.

E. E. Ranney, after many years service with the Cleveland Telephone Company, has resigned his position and has become affiliated with the Harrison Electric Company.

Col. Joe L. Hutton, State Bank superintendent, has tendered his resignation as president of the Citizens Telephone Company of Maury County, Tenn., and W. D. Shofner, president of the First National Bank of Mt. Pleasant, was elected as his successor.

On March 21, N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, New York, sailed for Europe. Mr. Kingsbury will spend five or six weeks in England and France.

W. H. Caman, commercial manager of the Beatrice district of the Lincoln Telephone Company, assumed charge of the local office at Beatrice April, 1, in addition to his general duties.

W. H. Lynch, local manager of the Consolidated Telephone Company at Carbondale, Pa., has been transferred to the Scranton office. E. O. Zarker, of the Scranton branch, succeeds him.

In honor of his twenty-five years service with the Chicago Telephone Company, Charles E. Mosley, formerly treasurer, was entertained at luncheon and presented with a watch by the officials of the central group of Bell telephone companies at the Mid Day Club. Mr. Mosley has retired under the pension rule.

C. E. Yost, president of the Northwestern group of the Bell telephone system and president of the Commercial Club of Omaha, Neb., has been elected a director of the Chamber of Commerce of the United States of America.

J. Brooke Boyle has assumed his duties as manager of the Chesapeake and Potomac Telephone Company at Cumberland, Md., succeeding H. C. Brown, who has gone to Baltimore as special agent for the same company.

R. F. Jones, Montreal manager of the Bell Telephone Company, will leave for a three-months trip to Europe.

F. F. Zimmerman, of Halls, Tenn., is the new local manager of the Cumberland Telegraph and Telephone Company at Henning, succeeding C. Walter Cates, resigned.

E. B. Williamson has accepted the management of the Mutual Telephone Company at Savanna, Illinois.

John A. Wallace, president of the Independent Telephone Company, New York, died March 27 in New York. Death was due to heart trouble.

P. R. Hemphill has been made local manager of the Home Telephone exchange at Orange, Texas.

Frank B. Knight, special agent of the Southwestern Telegraph and Telephone Company, at Dallas, Texas, died in that city April 1.

H. M. Vanbuskirk has been appointed manager of the Prince Edward Island Telephone Company, Canada, succeeding W. S. Grant.

M. J. Moloney, district manager for the New York Telephone Company, with headquarters in Paterson, N. J., has been assigned to special duties, with temporary headquarters in New York. E. J. Higgins, chief clerk of the New Jersey division, with headquarters in Newark, will succeed him.

NEWS FROM THE FIELD.

ARKANSAS.

The Southwestern Telegraph and Telephone Company has completed the installation of a new system at Magnolia. The company has installed a metallic circuit throughout and moved the central offices to the Longino-McKay brick on East Main.

The Southwestern Telegraph & Telephone Company plans to erect a new plant at Ashdown, to cost in the neighborhood of $10,000.

A. J. Mackey, manager of the Bell Telephone Company at Topeka, stated that the damage done by the recent storm amounted to about $50,000.

CALIFORNIA.

The Sunset Telephone and Telegraph Company of Tulare County has filed an application with the railroad commission, asking authority to transfer its system to the Tulare Home Telephone and Telegraph Company, at Tulare.

Pacific Telephone and Telegraph Company, 3-story class "A" telephone building, north side of Boulevard, 200 feet west of Thirty-fifth avenue; Oakland, $36,000.

The Los Gatos Telephone Company is enlarging and greatly improving its plant and system. The number of new teelphones has required the addition of more cables besides lengthening many service wires. The cost of the betterments will be over $8,000.

The Coley-Craig telephone system was taken over by the Pacific Telephone and Telegraph Company at Riverbank. The Riverbank Land Company took over the management and C. E. Abel, formerly of Fresno, was appointed agent. The present headquarters will be retained until the brick building being erected by the land company is completed, when the system will be put into its permanent quarters. The entire system will be rebuilt.

The Pacific Telephone and Telegraph Company has just completed the installation of a 320 line private branch exchange switchboard at the Hotel Clark, Stockton. It is equipped with 170 stations and five trunk lines. It cost $1,250 and the board replaces the present 80 line switchboard.

CANADA.

It is understood that it is the intention of the railway authorities to have a telephone exchange placed in the I. C. R. office at the Union Depot, St. John, N. B., in order to give a satisfactory telephone connection, both from the standpoint of the interests of the railway people and in the interests of the general public.

The Saltcoats Telephone exchange at Saltcoats, Sask., was damaged by fire to the extent of $100.

GEORGIA.

The Sugar Hill Telephone Company has been incorporated with a capital stock of $500,000 by J. L. Blackstock, Z. J. Fuller, T. G. McMillan and others to construct a rural telephone system from Gainesville to Athens Road.

LLINOIS.

The Central Union Telephone Company is excavating across First avenue at the corner of Third street, Sterling, for the purpose of laying an underground cable into the Lawrence building.

A recent severe lightning storm tore down a portion of the Chicago Telephone Company's toll lines west of Geneva. The wires were stripped off the poles as neatly as though cut with the pliers.

Anticipating the rapid growth of Moline within the next few years, the Central Union Telephone Company has just completed the installation of a large addition to its present switchboard service which will increase its capacity to about 5,000 telephones.

The Inter-state Telephone Company removed April 1 to the second floor of the McDonald building, Tenth street, Lockport. The company will occupy the front offices of the building.

Stockholders of the Kinloch-Bloomington Telephone Company elected the following directors: John T. Lillard, B. F. Harber, H. F. Farwell, R. E. Williams, Breckenridge Jones, Jr., N. T. Nolker and Henry Nicolous.

An intervening petition in the interest of creditors of the Western Illinois Telephone Company has been filed in the federal court in Peoria, asking that the property be sold in its entirety to satisfy claims. Behind this is a plan for reorganization.

A force of linesmen from Champaign are repairing the lines of the Bell Telephone Company in Seymour.

The Chicago Telephone private branch exchange installed at the Court House, at Joliet, is completed.

The Central Union Telephone Company has set a force of men in Rock Falls remodeling lines and making extensions.

INDIANA.

The Waldron Telephone System has been sold to Albert L. Winship, of Rushville, by William Emsweller, of Rushville, at $10,000. The system has changed hands twice during the month of March, being sold on March 1 by J. W. Buckingham, of Morristown, who had owned it for several years, to Mr. Emsweller.

The Citizens Telephone Company is negotiating for the purchase of a 40-foot strip off the north end of the C. H. Knight property on the corner of Walnut and Jackson streets, Brazil, recently purchased by the Elks, and if the deal is made the company will erect a modern telephone plant on this property.

IOWA.

H. L. Beyer, of Grinnell, was re-elected president of the Iowa Independent Telephone Association, at the annual election of officers. C. C. Deering, of Des Moines, was chosen as secretary-treasurer for a second term. The executive board for the coming year includes George Atkinson, of Creston; H. A. Kinney, of Woodbine; H. B. Shoemaker, of Toledo, and J. M. Plaister, of Fort Dodge.

At the annual meeting of the LeClaire nIdependent Telephone Company it was decided to purchase a new switchboard in the near future.

The board of directors of the Northwood Telephone Company selected plans for the new building for the central office on the lots on Main street, Northwood, which they purchased last fall. The new building will be modern in every respect and an ideal home for the company.

The Schleswig Telephone Company has received a car load of telephone poles and extensive improvements are in contemplation.

The Rhodes telephone exchange, including switchboard, wires, poles, office furniture, and the line known as Number 51, extending west of Rhodes, has been sold by C. M. Head to E. G. Beye. The latter paid $2,600 for the exchange, according to a bill of sale filed in the office of the county recorder.

Filing of a $35,000 bond signed by President E. H. Moulton and Secretary H. Osborne, of the Tri-City Automatic Telephone Company recently, insures the city that actual operations will be begun by the company within thirty days in the installation of an automatic telephone service in Davenport. It is stated the company will construct 173 miles of trench for conduits in Davenport, Rock Island and Moline, in each of the cities a franchise having already been granted.

W. H. Foley, of Sanborn, has purchased the Alton telephone system from David Barker.

The Cedar Rapids and Marion Telephone Company will begin laying tile conduits along the south side of Third avenue, east, from Second street to Blake boulevard, and then north on Seventeenth street to the alley between First and Second avenues, Cedar Rapids. This will be the first step in a big improvement that is to be made in the company's property in this city and will cost $85,000.

The new switchboard for the Farmers' Mutual Telephone Company at Clarinda arrived and will be installed in the new quarters in the Linderman block.

KANSAS.

The Kansas Public Utilities commission granted permission to the United Telephone Company, with headquarters at Salina, to take over the Phillipsburg and Kirwin exchanges of the Empire Telephone Company. According to J. O. Wilson, of Salina, president of the United Telephone Company, the price paid for the Empire interests was $36,000.

The Independent Telephone exchanges along the Rock Island southwest of Hutchinson are considering putting in another long distance line from Hutchinson to Liberal.

Work has been started on a $10,000 building which the Arkansas Valley Telephone Company is to erect in Dodge. The building is to be on a corner in the business part of town. It will be of mat brick, and two stories in height. A complete new telephone system will be installed to replace the old system, which has proved inadequate for the growing town. The building and plant will be completed in September.

KENTUCKY.

Concord Telephone Company, Concord; capital, $2,000; incorporators, A. Ashenhust, Julius Ashenhust, W. O. Call and Floyd Call.

The Cumberland Telephone and Telegraph Company is making immediate preparations to extend its long-distance lines

from Hazard, Perry county, via Whitesburg and so on, to Fleming, Haymond, McRoberts and Jenkins, in the big coal fields, thereby giving direct connection with Louisville and other up-state cities. Work will begin at once.

The Calrose Rural Telephone Company, Bloomfield, has been incorporated by J. C. Drake and others, for the purpose of building a line of telephone.

MASSACHUSETTS.

Application for a franchise for the Memphis Automatic Telephone Company was made to the city commissioners, in the names of C. W. Thompson, J. B. Goodbar, T. R. Winfield, L. W. Johnson, George G. Alban and others. The company proposes to buy out the Memphis Telephone Company, reorganize under the name of the Memphis Automatic Telephone Company, with an authorized capitalization of $2,000,000, and spend $500,000 in telephone extensions. The application asks a franchise for thirty years, at established rates to subscribers lower than rates fixed by the city in its recent rate ordinance.

Every telephone line in Worcester was put out of commission by a fire in the Central Exchange, March 28. The fire started in the cableroom and worked through the network of cables that carry the 18,000 telephone lines of the city to the switchboards. Telephone officials refuse to estimate the loss by the fire itself and the loss to business houses resulting from the lack of telephone service is also expected to run high in the thousands.

The New England Telephone & Telegraph Company has a large force of men at work installing the new apparatus in the top floor of the Pritchard building in Bank street, Springfield, which will be used as an operating room. A new board is to be installed and it is estimated that the work of fitting up the new quarters will cost about $30,000.

The directors of the American Telephone & Telegraph Company at Boston have declared regular quarterly dividend of $2 per share, payable April 15 to stock of record March 20.

The directors of the New England Telephone & Telegraph Company at Boston have declared the regular quarterly dividend of $1.75 per share, payable March 31 to stock of record March 18.

MICHIGAN.

A new and larger telephone cable is being laid from Grosse Ile to Stoney island by the Michigan State Telephone Company for the Wescott marine reporting station. This cable will lead a direct communication to Detroit.

Sutton Bay Telephone Company, Sutton Bay, $4,950.

Directors of the Michigan State Telephone Company were re-elected at the annual stockholders' meeting, April 14. The board will meet June 12 to elect officers. The board comprises: Frank W. Blair, Emory W. Clark and Henry Russel, of Detroit; Dudley E. Waters and William Judson, of Grand Rapids; U. N. Bethell, N. C. Kingsbury and Theodore N. Vail, of New York, and Alonzo Burt, D. M. Cummings and B. E. Sunny, of Chicago.

Munith Telephone Company has been incorporated with a capital of $1,000.

The crew in charge of improving the general telephone system of Menominee has completed operations on Stephenson avenue, where all open wires have been taken down and have been replaced by standard cable. The cable betters appearances in general and does away with the network of wires that heretofore existed.

The Michigan State Telephone Company is planning to expend about $25,000 in making improvements in Menominee. An estimate has been approved for the expenditure of $3,039 to place additional cable facilities on North State street and Stephen avenue, work to be commenced about May 1. The largest amount to be spent will be in placing a toll line between Republic and Iron Mountain, a distance of forty-three and one-half miles.

Estimates have been approved by the president of the Michigan State Telephone Company covering the replacing of iron wire in the toll line circuit between New Buffalo and Lakeside, with copper wire, which will entail an expense of $1,273. This work will be completed in the early spring and will greatly improve the long distance service between Lakeside, St. Joseph and Benton Harbor, and also between Lakeside and Chicago.

MINNESOTA.

The Tri-State Telephone Company has had a crew of men at work on its line between Pine City and Pokegama lake for the past couple of weeks putting on new cross arms, stringing new wire and otherwise improving the line.

The state forestry department is building a telephone line from the Nett Lake Indian reservation to connect with the Big Falls line at Dentaybow, which will be completed shortly.

Forty-eight telephone conversations were going on when the new $232,000 main switchboard of the Northwestern phone lines took up in twenty seconds the work of "Old Main," which did service in Minneapolis for 19 years.

Capitalized at $800, with shares at $8 each, articles of incorporation for the Embarrass Farmers Cooperative Telephone Company were filed recently with Charles Calligan, register of deeds. The company will conduct a cooperative rural telephone system at Embarrass and vicinity. Oscar Salminen, John Nelimarkka, William Pilkkarinen, John Koski and A. W. Havesla, all of Embarrass, are the incorporators.

At the annual meeting of the board of directors of the Zenith Telephone Company of Duluth March 2 the following officers were elected: E. H. Moulton, president; H. B. Knudsen, vice-president; G. W. Robinson, treasurer; Frank E. Randall, secretary; A. J. McCulloch, assistant treasurer and general manager. The board of directors is composed of the following: E. H. Moulton, D. M. Neal, Frank E. Randall, G. W. Robinson, H. B. Knudsen, C. B. Randall, E. L. Bradley.

Dr. J. A. Gates, owner of the telephone exchange, together with the Northwestern Telephone Company, is making plans for rebuilding all the lines at Kenyon, work to begin in spring.

MISSISSIPPI.

The Home Telephone Company at Jackson will commence work May 1 changing its system from the automatic to the standard manual equipment. Officers of the company state that it will take about sixty days to make the change, and they hope to resume service by the first of July.

After expert inspection had been made of the Cumberland Telephone Company's 4,400 feet of Mississippi river cable, connecting the Mississippi and Louisiana wires, it was learned that the flash of lightning which penetrated the cable from the Delta Louisiana landing April 18 had completely burned out the costly connection, and it is now necessary to relay the entire cable.

MISSOURI.

The Mt. Vernon Telephone Company is repairing their line, setting new poles and putting on a new wire.

The Home Telephone Company, 419 Joplin street, has acquired control and management of the plant of the Missouri and Kansas (Bell) Telephone Company, 316 Joplin street, as provided in arrangements made last November. The Bell company will continue to maintain an office for the purpose of routing long-distance business through or into Joplin. It will not directly accept any local or long-distance calls out of this city, however. The main offices of the Home company will remain in the old plant for one month, or until the "cut over" between the two systems is made Saturday night, May 2. The offices and plant of the Bell company will be in charge of Harry E. Davis, superintendent of the Home company, pending the cut over. William O. Randall, general superintendent of the Home Telephone Company here, will remain in charge of the present Home plant.

The Missouri-Kansas Telephone Company of Jefferson City was authorized by the Missouri public service commission to issue $7,500,000 in notes to refund a similar amount of notes held by the American Telegraph and Telephone Company.

The Bell Telephone Company was given a warrant on Greene county for $28.95 by order of the county court recently. The money is for pay of use of telephones in county offices and institutions for the month of March.

The Missouri commission authorizes the Queen City Mutual Telephone Company to purchase property of Southwestern Telephone & Telegraph Company in Queen City.

MONTANA.

The Mountain States Telephone and Telegraph Company is planning some extensive improvements and extension of lines in the county for the coming summer. One of the lines to be built in Twin Bridges will run from the Mule Shoe ranch to the J. H. Thomas ranch, taking in several ranches en route. The poles are now being set.

Directors of the Eureka Mutual Telephone Company have decided to construct an extension of their lines up Sinclair Creek to Gateway. It is understood the work will be commenced early in the spring.

At a recent meeting of stockholders of the Dry Creek Telephone Company at Belgrade J. M. Moore was chosen president; G. D. Tribble, vice-president; Wesley Davis, secretary; C. F. Angell, chairman, and Ralph Adams, John Yates and W. D. Brownell, trustees for one year.

At the annual meeting of the stockholders of the Home Telephone Company in Ballantine the following directors were elected for the ensuing year: Charles Sindelar, president and manager; A. P. McIntyre, secretary-treasurer; C. B. Moore of Pompey's Pillar, F. F. Ruggles of Anita, G. A. Gilmour, Frank Glasgow and C. O. Stout.

The Continental Telegraph & Telephone Company has installed an office in the Milwaukee building at the corner of Second avenue south and Third street, Great Falls. E. M. Stablein, general agent for the Milwaukee company, will be temporarily in charge of the telegraph office.

NEBRASKA.

The Evergreen Telephone Company held a meeting at Norfolk, and elected the following officers: President, Herman W. Buettow; secretary-treasurer, Arnold Pasewalk; lineman, Herman Hille.

The sale of the Lincoln Telephone and Telegraph Company's holdings at Glenville to the Independent Telephone Company at that place is announced by manager R. A. Wylie of the Lincoln Company. The deal was made with W. F. Johnson and Homer McKelvie, of Harvard; George Briggs of Annandale and Messrs. Richard Deringer and Charles Johnson of Glenville, representing the Independent concern.

An independent telephone system is to be installed at Cook, a small town near Tecumseh. At a meeting of farmers and business men of that vicinity a company was organized to finance the project and the work of disposing of stock is already well under way. These officers have been elected by the stockholders: August Ihde, president; J. H. Howarth, secretary; Ernest Dieckhoff, treasurer; August Doeden, G. C. Betzelberger and John Weber, board of directors.

The Monroe Telephone Company has purchased the Bell exchanges in Newman Grove and Genoa. The deal is to be closed in Columbus March 12. E. B. Danna, manager of the Monroe company, says the consolidation of the service will not be fully effected before the first of May, but he expects to push the work along as rapidly as possible.

The town board met recently and granted a franchise to the Chadron Telephone Company to establish a system in Harrison and connect with the county lines. A toll line will also be built to Van Tassell and Lush Wyo., and to Crawford, Neb., thereby putting Harrison in touch with neighboring towns.

I. J. Jamison & Sons, owners of the Citizens Telephone Company, with exchanges at Malmo, Morse Bluff, Prague and Weston, Saunders county, have traded that property for the Creighton Gas, Electric Light and Power Company property with H. A. Cheney, the Creighton banker. The phone plants are valued at $41,000. The light and gas property was taken in exchange and $16,000 bonus paid the Jamisons.

The Nebraska Telephone Company made its "change-over" from the old to the new exchange at Holdrege, March 28, at six o'clock in the evening, taking three minutes time for the cut-over.

Instead of constructing a new telephone exchange residents of Graf who have been agitating the question of a new system may purchase the exchange of the Lincoln Telephone and Telegraph Company at that place. At a meeting of men interested in the project, held at Graf, April 4, a committee was appointed to confer with officials of the Lincoln Company relative to the sale.

The contract for the construction of the new exchange building of the Lincoln Telephone & Telegraph Company at Red Cloud, was awarded to T. A. Johnson of Fairbury. The building will be one story high, constructed of concrete and pressed brick. The contract price was $5,700. Construction work will begin at once.

The switchboard, telephones and other apparatus of the Norfolk Long Distance Telephone Company, commonly called the "automatic company," has been sold to a Santa Monica, Cal., telephone concern by the Nebraska Telephone Company, which purchased the plant. The California representative was in Norfolk and the plant is to be shipped to the western coast at once.

The Harvard Telephone Company has asked the railway commission to set aside an order authorizing the company to discontinue switching service and privileges granted to the Clay County Rural Phone Company. The Harvard Company is now giving free switching service to the rural company.

Managers Wilson and McAdams, of the Nebraska Telephone Company left Omaha for a conference with the directors of the Hooper Telephone Company. As a result of the meeting, the Nebraska company may take over the Uehling exchange which belongs to the Hooper company.

NEW JERSEY.

It cost the Delaware and Atlantic Telegraph and Telephone Company, known as the Bell system, $26,000 to remedy the ravages of the March blizzard on its Somers Point system, and to supplant it with one that it is expected no future storm can damage, according to general manager C. B. Smith, who declares the situation created by the storm was the most peculiar in all his experience.

NEW YORK.

The following officers and directors were elected by the stockholders of the Crystal Springs and Dundee Telephone Company at its annual meeting held in the Crystal Springs schoolhouse March 28: President, Alonzo Eaton; vice-president, John Hallock; secretary, Mervin Price; treasurer, Simpson F. Lamphear; manager, John Faucett. The directors included all of the officers and Fred Sebring.

The Killawog Telephone Company, which is located in the Peck block at Marathon, has purchased the store and harness shop formerly occupied by the late William P. Tyler in East Main street. The company will remodel the building and install new cables and a switchboard.

Subscriptions amounting to $4,350 toward the organizing of a Skaneateles Peoples Telephone Company and announcement that the system could be placed in operation, with 500 telephones, were reported at a public meeting in Skaneateles recently. A motion was passed directing a committee to proceed with organizing the company, but the system may not be installed for the present.

The six-story Telephone Exchange at 221 to 227 East Thirty-seventh street, New York, erected about two years ago, will be enlarged to twelve stories. Plans for the alteration, involving this addition of six stories, were filed by the architects, McKenzie, Voorhees & Gmelin, the cost being placed at $200,000.

The New York Telephone Company will begin work April 13 in lowering its conduits in Main street, Batavia, in order that they will not interfere with the paving of the street.

The Board of Directors of the Rochester Telephone Company has ratified a plan for doubling the capacity of the switchboard in the Stone street exchange. The present capacity of the board is 7,500 lines. The new switchboard when completed will have five sections with a capacity of 3,000 lines each, or 15,000 lines.

The annual meeting of the stockholders of the American Telephone & Telegraph Company will be held in New York Tuesday, March 31, at noon. Books close March 20 and reopen April 1.

A new toll line will be strung from Watertown to the Thousand Islands in the spring, but this will not require a new pole line. The total cost of the improvement will not be over $500.

The board of village trustees of Penn Yan met March 16, when a resolution was passed giving the New York Telephone Company the privilege of erecting poles on different side streets so their lines could be strung to the Main street conduit.

NORTH CAROLINA.

Under the direction of H. L. Edwards, foreman for the Southern Bell Telephone Company, a construction force is now engaged in building a considerable amount of aerial cable for the use of the Salisbury exchange and for long-distance and rural services.

NORTH DAKOTA.

The Saline Telephone and Trading Company is the name of an organization recently started in the vicinity north and northwest of Granville. As a first step they are making efforts to get telephone connections with Granville. Chas. L. Ehart is secretary and treasurer.

L. D. Richardson, manager of the Fargo exchange of the North Dakota Independent Telephone Company, was elected president of the North Dakota Telephone association just prior to the adjournment of the convention at Fargo. The officers chosen for the association for the ensuing year are: President—L. D. Richardson, Fargo. Vice-president—Henry Wilson, New Rockford. Secretary-treasurer—R. B. Baird, Fargo.

Home Telephone Company, Hannah, Cavalier county; capital stock, $50,000; incorporators, Chas. B. McMillan, Jas. Balfour and M. J. Dixon.

The Northwestern Telephone Company at Sanborn is removing its exchange to the rooms over Winterer's department store, where more and better accommodations will be had for the public and the operators.The plant will be improved throughout.

The Winfield Rural Telephone Company of Winfield township has closed its business with the Northwestern Telephone Company in the purchase of the Spiritwood south line. All business hereafter will be done through the Winfield Rural Telephone Company.

The Home Improved Telephone Company at St. Thomas suffered a loss of $2,500 by fire March 17.

OHIO.

President Bayard Kilgour and Attorney Joseph Heintzman, representing the Cincinnati and Suburban Telephone Company, presented requests to the State Utilities Commission at Columbus April 8, that the company be allowed to issue at par a further amount of $618,150 of stock, $145,000 of which is to be used to complete the new building at Hammond and Fourth streets and the balance to be used in completing conduits. The commission took the matter under advisement.

The Longmeyer Rural Telephone Company, Van Wert; $620 to $2,000.

The Greenville Home Telephone Company which operates in Darke county, was given the right to purchase the property of the Bloomer Home Telephone Company by the state utilities commission. The price to be paid for the Bloomer property is $3,575.

The directors of the United Telephone Company at a meeting in Bellefontaine elected the following officers: President, J. Q. A. Campbell; first vice-president, Dr. F. M. Galer; second vice-president, Dr. W. S. Phillips; secretary-treasurer, Earl M. Smith; cashier, Evelyn Wellman; wire chief, J. F. Diener.

The Newark Telephone Company was given permission by the state public utilities commission to lease the properties of the Gratiot and Brownsville Telephone Company. The annual rental is to be 6 per cent on a valuation of $12,870.

Preliminary to extensive refinancing, the Cleveland Telephone Company has requested authority from the Ohio State Public Utilities Commission to issue and sell $4,000,000 two-year 5 per cent notes at a price not to yield the purchaser more than 6 per cent.

Cincinnati & Suburban Bell Telephone Company declared the regular quarterly dividend of 2½ per cent on the stock April 1. Books close March 25 and reopen April 1.

March 6 fire started in the basement of the Stark Telephone Company's central exchange building at Canton, but was extinguished without great loss.

The Farmers' Telephone Company of Sidney has asked the state public utilities commission for permission to issue $76,000 stock, the proceeds from the sale of which will go to retiring bonds.

The Ohio commission authorizes the Home Telephone Company to sell to the Athens County Home Telephone Company its toll line extending from the village of Stewart to the city of Parkersburg, W. Va., for the agreed sum of $14,000.

OKLAHOMA.

Improvements entailing the expenditure of approximately $100,000 will be installed by the Pioneer Telephone Company in Tulsa within the next six months, it was made known by George F. Bell, manager of the Tulsa branch of the corporation. Substantially the following is what the telephone people plan to add in the way of improvements this summer: Sixteen miles of aerial cable and 1½ miles of underground cable; estimated cost, $75,000. Six new local switchboard positions and six new long distance positions; estimated cost, $20,000. Work on the additions already has been started and will be pushed as rapidly as possible. All the new cable will be up and ready for service inside of five or six months.

Southeastern Telephone Company of Gage. Capital stock, $2,000. Incorporators, A. Luthi, L. E. Moss, Rose Luthi, Gage.

Silver Ridge Telephone Company, Silver Ridge Schoolhouse, Cashion; capital $250. Incorporators, McCord Wilson, George C. Eschwig, C. P. Ward, Cashion.

A fire in Weleetka damaged the Pioneer Telephone Company's lines to the extent of $300.

The Norman Telephone Company will soon begin the erection of a building at the corner of Main and Santa Fe streets. Messrs. Smith have the work in charge.

C. W. Clark has sold his half interest in the Taloga & Dewey Telephone Company to Wilson Bros. W. H. Wilson is president of the company.

OREGON.

Articles of incorporation of the Yaquina Bay Telephone Company, capitalized at $50,000, were filed for record in County Clerk Coffey's office. The officers of the company are A. Welch, E. W. Hall and A. Prichard.

The new home of the Pacific Telephone and Telegraph Company at the southeast corner of Park and Oak streets, Portland, to cost about $600,000 exclusive of equipment is nearing completion.

W. H. Dancy, local manager of the Pacific Telephone & Telegraph at Salem announced as soon as the weather would permit the company would start extensive construction work between Portland and Salem. The 60-wire lead, which was started last year, will be completed at a cost of $75,000.

PENNSYLVANIA.

After a struggle extending over several years the Bell Telephone Company obtained from New Castle the right to place its wires in the municipal conduit. Both the city and the company have wanted the wires underground, but the company placed such conditions around its application that the city refused to accept, until three members of the five commissioners voted favorably.

To Thompson-Starrett Company, Second National Bank Building, Pittsburgh, for Bell Telephone Company, Philadelphia. Nine-story brick, terra cotta and steel building, 58 x 180 feet. John T. Windrim, architect.

The Bell Telephone Company of Pennsylvania has declared usual quarterly dividend of 1½ per cent, payable April 15 as registered April 8. Books close April 8.

Frank Rogers of Ellwood City, has been awarded the contract for the improvements to be made by the Bell Telephone Company to their buildings in New Castle. Rogers will begin work on the contract within a short time.

The Keystone Telephone Company, Pittsburgh, has declared the regular semi-annual dividend of 3 per cent on the preferred stock, payable May 1, to holders of record April 21.

The Pennsylvania Railroad in the Pennsylvania and the East Liberty stations are having extensions made by the installation of a number of new pay telephones.

Wm. R. Chapman & Sons have the contract to demolish the dwellings at 1631 to 1637 Arch street, Philadelphia, and clear the site for the $1,250,000 office building to be erected for the Bell Telephone Company.

The Consolidated Telephone Company is having plans made by Ruhe & Lange for the enlargement of their building on North Seventh street, Helentown. The company has established full connection with the blue Ridge Telephone Company, a new company organized a year ago with a capital of $50,000.

A private branch exchange has been installed in the Williamsport hospital by the Bell Telephone Company.

The Bell Telephone Company will expend $45,000 on underground conduits and cables in Pottstown.

Plans were filed March 10 in the bureau of building inspection for a $1,250,000 office building to be erected at the northeast corner of Seventeenth and Arch streets, Philadelphia, for the Bell Telephone Company. The new building, which was designed by John T. Windrim, will be a fifteen-story structure, 86.1 feet front on Arch street, 157 feet deep, 49.9 feet front on Appletree street and 59.1 feet front on the parkway, which will cut through the northwest corner of the company's lot. It will be a fireproof structure of reinforced concrete and steel, having walls of brick, granite and terra cotta.

Improvements and additions to cost $8,137,000 are to be made to plants, buildings and lines operated by the Bell Telephone Company of Pennsylvania in Pennsylvania, Delaware, southern New Jersey and parts of Ohio and West Virginia this year, it was made known by the company March 15. During the year it is planned to construct 1,030,000 feet of conduit, for which trenches will have to be dug four times the length of the Panama canal.

The directors of the Johnstown Telephone Company have agreed to the proposition submitted by the Bell company by which the Johnstown subscribers are given long distance connections over the Bell system where such service is desired. The agreement to be entered into is in keeping with the plan approved by the officials of the United States department of commerce some time ago following the ruling to the effect that the Bell company was maintaining an illegal monopoly.

SOUTH DAKOTA.

For the Short Line Telephone Company of Owanka, with a capital of $2,000; incorporators, F. B. Stiles, W. R. Littlefield, Owanka; G. H. Bailey, New Underwood.

Articles of incorporation have been filed for the Jerauld County Farmers' Telephone Company, at Wessington Springs, capital $30,000; incorporators, J. D. Powell, S. E. Miller, W. C. Grieves and others.

The Union Telephone Company of Hartford, that owns all the farmers' lines in this vicinity, has bought the local plant from the Hartford Electric Light and Telephone Company, and will operate it along with the county lines. Will Haugen has been chosen manager for the new combination. It is probable that a new central office will be built in Hartford in the near future.